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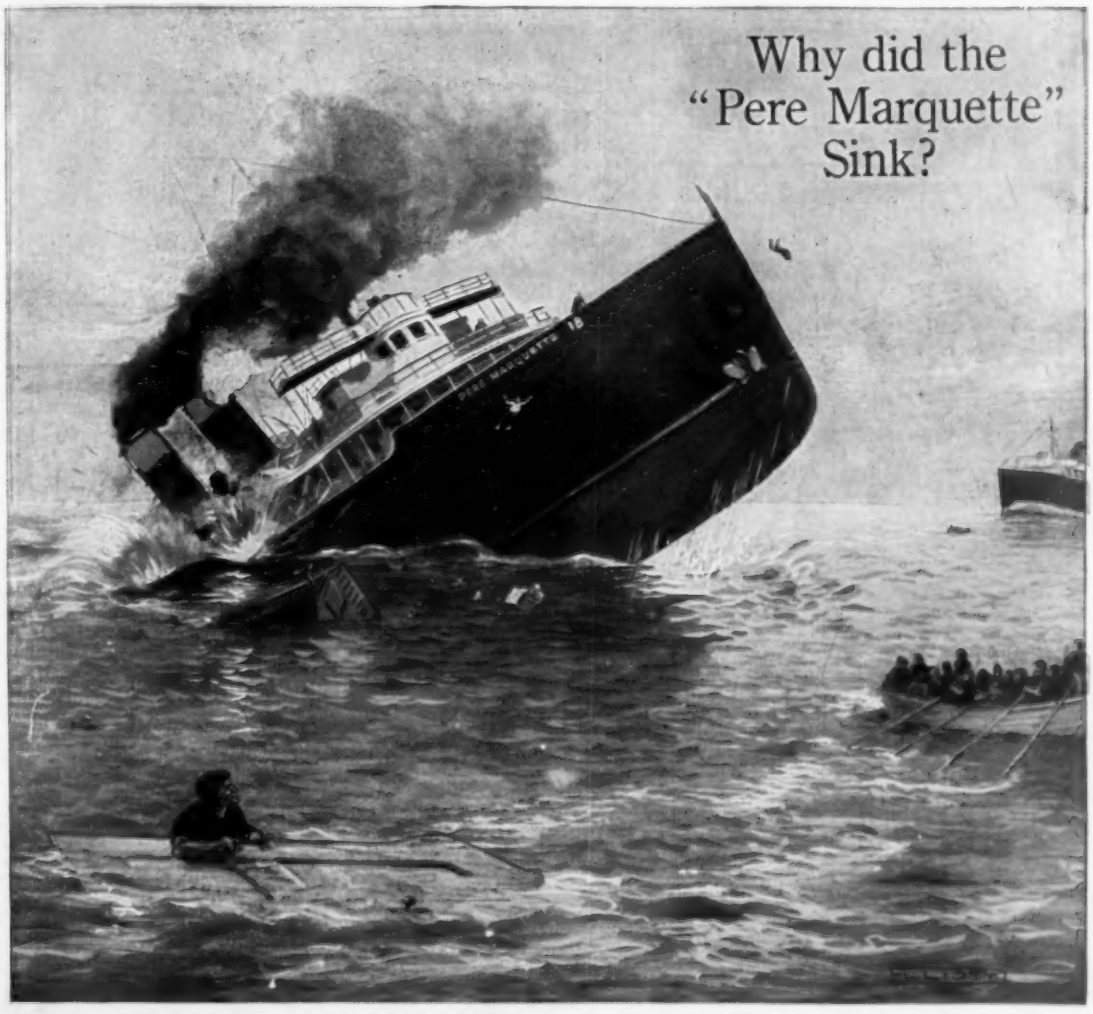

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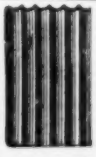

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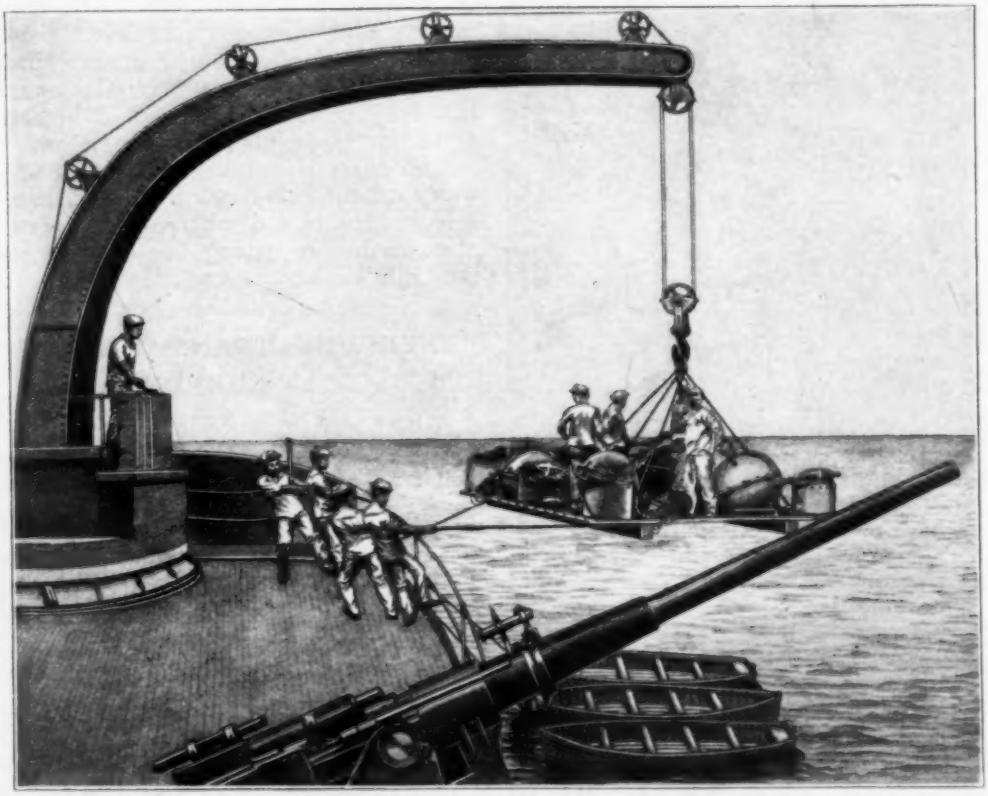
Popular Mechanics

Written So You Can Understand It

Vol. 14 NOVEMBER, 1910 No. 5

A PLATFORM OF DESTRUCTION



Preparing for Mine-Laying Practice

THIS curious bundle being lowered over the side of a United States battleship at the end of a big crane is a mine platform very much loaded down with mines and a mine-laying crew. Supported by three of the ship's small boats, the assemblage will be towed to a safe distance, and the crew will drill in the laying of the mines. The mines are of the electric type, and contain sufficient gun-cotton to blow the ship and themselves to atoms, should it explode.

Practice of this nature goes on almost continually in this as well as the other great navies of the world, as the necessity of laying mines across a harbor's entrance to block an enemy's fleet may develop in any war. Practice in handling mines is as necessary as practice in handling big guns.

Father and Daughter, 190 Feet Above the Street

CHILD MAKES PERILOUS TRIP UP CHURCH SPIRE

Hundreds of people living in the vicinity of the First Place Methodist Church of Brooklyn were held spellbound on August 19, as "Steeplejack Hughes" swung 190 ft. in the air from the spire of the church with his little four-year-old daughter Ethel on his lap.

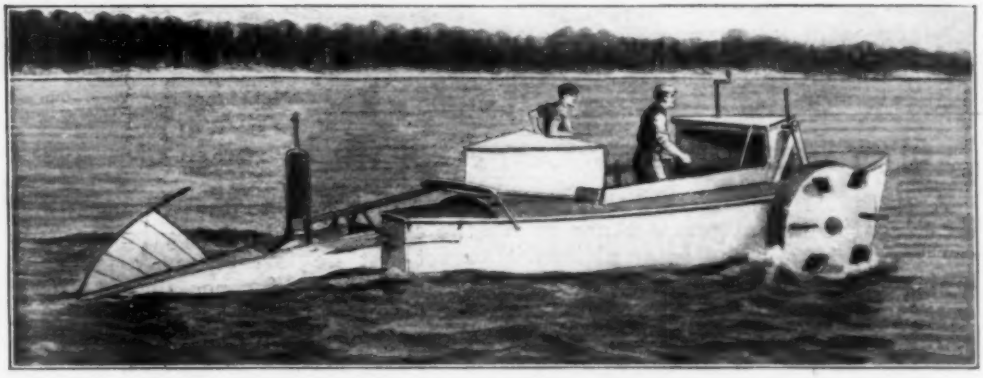
The crowd looked up with apprehension and astonishment as they reached the height of ascent. Hughes, who is a professional steeplejack, had the contract to paint the steeple and was about to begin the climb, when his daughter rushed up out of breath and said "Dada, please take me along." As no special arrangements had been made for the carrying of an extra passenger, Hughes demurred for a few minutes before giving his consent to the child's whim.

FENCE WIRE TRANSMITS 25,000-VOLT CURRENT

A barbed-wire fence in Michigan recently served so efficiently as a 25,000-volt transmission line, that the men in charge of the sub-station of the hydro-electric plant received no intimation that the line was in trouble until farmers working some miles distant reported that one of them had received a severe shock.

Investigation developed the fact that one of the lower wires had broken between two poles and the ends had fallen so that they hung against the top wire of the fence, quite a distance apart. Thus a circuit was completed by the fence wire. The loose transmission gave no evidence of distress.

As the transmission was required for the delivery of the full load to two towns whose service could not very well be interrupted, the fence, properly patrolled to keep people at a distance, was allowed to play its part until after midnight, when the circuit could be repaired without interruption of the service.

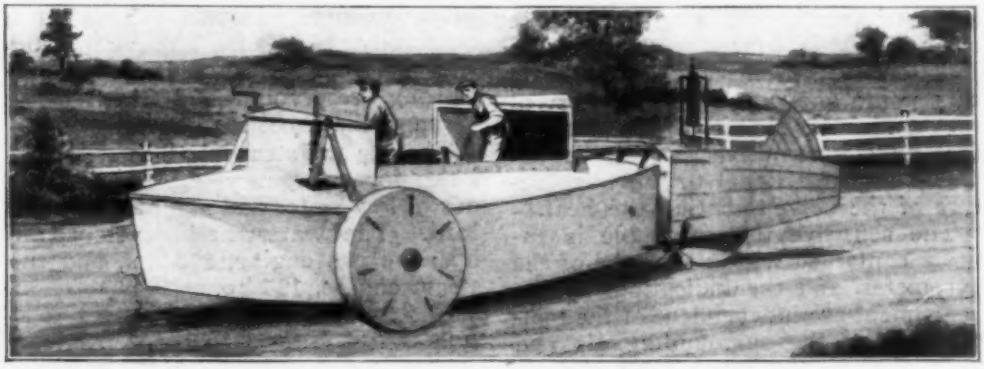


"Amphi II" As It Appears in the Water

ANOTHER AMPHIBIOUS AUTOMOBILE

An amphibious automobile, designed by Rear Admiral J. A. Howell, U. S. N., retired, has been given a number of tests recently. The vehicle has been devised as a pleasure machine and it is the idea of its originator to use it at beaches along the coast where a combination of motor car and motorboat would be found very convenient. Admiral Howell has built several of the cars during the past two years, to which he has given the general name of "pleasure surf boats."

The latest model of the machine, which is called "Amphi II" has just been finished. It is so constructed that it can be used in a heavy surf without danger or discomfort to its passengers, of which it can carry six. It is 20 ft. long, 6 ft. beam and has a tail piece 10 ft. long. The road wheels are 4 ft. in diameter and 8 in. wide. The wheels, of which there are three, are cased with iron and have recesses for paddles. There is one screw propeller having three 18 by 22-in. blades on the port side. The engine used is a single cylinder, 10-hp., two-cycle gasoline motor which gives the car a speed of 12 miles per hour on land and four miles per hour in water. There is planetary transmission between the engine and propelling mechanism on land and water. There are two watertight bulkheads, one forward and one aft. The after compartment holds the water and gasoline tanks, each of which has a capacity of 20 gal. The tailpiece is pivoted to the hull, and an iron tiller, operated by wheel and chain in the cockpit, steers



Admiral Howell's Amphibious Automobile

both on sea and land. Spiral springs, 17 in. long, with an outside diameter of 6 in. are used on the front axle, but a stronger spring is required for the tail wheel, to keep the propeller clear of the bottom.

ELECTRIC FIXED-FOCUS PORTABLE PYROMETER

A portable pyrometer that will measure the actual temperature of a furnace without being inserted into it is shown in the accompanying illustration. The thermo-couple is composed of two very small wires of different alloys, joined together at one end, the free ends being connected to an electrical circuit, including a flexible cable and an indicating milli-voltmeter. The radiant heat is concentrated upon the junction of the two alloys and heats this point above the temperature of the rest of the circuit, with the result that an electromotive force is set up which is proportional to the temperature of the body radiating the heat.

Measuring Heat with the Pyrometer

The sensitive thermo-couple is entirely contained within the tube of the pyrometer, and the indications of the instrument are independent of the temperature of the surrounding air and that of the tube itself. All that is necessary in measuring the temperature of a furnace, is to point the tube centrally at the peep-hole or door, and the temperature is shown on the indicator dial. As to the distance limit, the center ring on the pyrometer tube must not be farther away from the opening of the furnace than 10 times the diameter of the actual opening. If the opening is a furnace door, 12 in. in diameter, the center ring on the tube must be within 10 ft. of the inside edge of the door. If the opening is a 3-in. peep-hole, the working distance from its inside edge must not be more than 30 in.

ELECTRIC PLANT USES THREE KINDS OF POWER

The provision of three kinds of power producers, a waterwheel, gas engine and steam engine, to operate the generators, makes the electric power plant at Winnemucca, Nevada, unique.

For the greater part of the year, the plant is operated by power from the waterwheel, which is supplied with water from a 500,000-gal. reservoir, four miles distant. The water is conveyed to the wheel through a pipe line composed of 12, 10 and 8-in. pipe, there being 7,500 ft. of each. The head is nominally 1,100 ft. The water discharged from the wheel is collected in settling reservoirs and then piped through the town for general use.

The gas and steam engines are auxiliaries for emergency use during periods of low water and at times of overload. The waterwheel develops 150 hp.; the gas engine, 175 hp., and the steam engine, 125 hp.

¶The citizens of Seattle are contemplating the erection of a concrete statue of Washington, 100 ft. high, for the celebration, in 1914, of the 25th anniversary of the admission of Washington to statehood.

DOGS AS RED CROSS SCOUTS

The value of well-trained dogs of the Red Cross Service in the succor of the wounded, especially at night, has been well demonstrated by the work done by such dogs in recent maneuvres of the German and French armies.

The Red Cross in France has a department for the special training of dogs, and through its efforts the canines are taught to search out the wounded and draw attention to their location. Untiring work has trained them not to bark or howl when coming upon a wounded soldier, but to retrieve some object belonging to him and carry it to the first Red Cross worker that can be found. When the worker takes the object from the dog's mouth, the animal turns about and leads the way back.

French Red Cross Dog Retrieving a Hat

This Dog Found Nothing Lighter than the Gun

German Dog Barking for Help

On the other hand, the dogs trained for the same work in the German army, stay by the wounded soldier and bark or howl until aid arrives.

¶The Suez Canal Company has announced that, beginning Jan. 1, 1911, its rates for transit through the canal will be $1.40 per ton for freighted ships and 91.6 cents per ton for ships in ballast, a slight reduction in the existing tariff.

AIR-MOTOR FOR WINDOW-CLEANING

Cleaning the windows of stores or residences is a simple task compared

Window-Washer Driven by Compressed Air

with the keeping clean of factory and machine shop windows, yet the operator shown in the accompanying illustration does not find the work difficult, owing to the tools at his disposal. He is using an air motor, in the socket of which a stiff brush is held. The brush is dipped in benzine almost as often as the ordinary window-cleaning sponge is dipped in water, and then run over the glass. After the glass has dried, a soft, dry brush is used for polishing.

TRANSCONTINENTAL RAILWAYS OF THE WORLD

Of all the world, Africa and Australia are the only continents not yet crossed by a through railroad, but such a system is soon to be commenced in Australia.

The first transcontinental railroad in the world was the Union Pacific, completed a little more than 40 years ago. Since that time six lines have been built across the Rocky mountains in this country. Canada has one transcontinental line, and another is under construction; Mexico has one, and the trans-Andean line across South America, connecting the Atlantic and Pacific oceans, is now in operation. The trans-Siberian railway forms a through line across Europe and Asia.

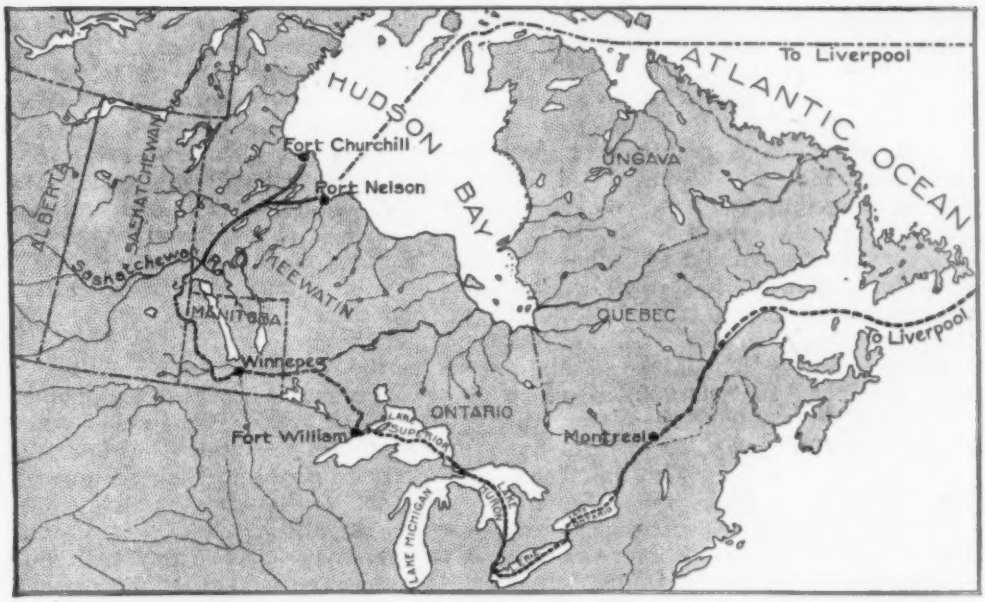
A QUEER PET

Visitors to Southern Arizona find the privacy of their homes invaded in a delightfully free and easy way by the original settlers of that region, namely the scorpions, centipedes, tarantulas, etc., but about the oddest of these house pets is one that visited the writer and remained a constant guest on the screen door and the walls of his tent. It is a little grey lizard about 8 in. long, which differed from the others of his tribe in having two tails, one of them jutting off at right angles from the regulation caudal appendage.

Although he was constantly about the house, it was difficult to get the camera near enough to photograph him, but finally it was accomplished when he was on the screen door and the photographer inside the tent. The photograph therefore shows Mr. Liz-

A Companionable Lizard

ard against the light, forming a silhouette which shows the peculiar forked tail very clearly.—Contributed by C. L. Edholm, Los Angeles, Cal.



Map Showing Proposed Routes of Hudson's Bay Railroad—Note Distance to Atlantic Ocean by Hudson's Bay Route and Via Great Lakes and St. Lawrence River

Why Canada is Building a Railroad to Hudson's Bay

By J. L. PAYNE

Comptroller of Railway Statistics, Department of Railways and Canals, Ottawa, Can.

THE Canadian people, with a growing appreciation of their heritage in the northland of America, and nudged by necessity, are disposed to make large sacrifices for the building of railways. When they of the larger faith projected the Canadian Pacific in 1880, there were many who knew not which to condemn the more —the folly of the government which offered a subvention of $25,000,000 in cash and 25,000,000 acres of land, or the imprudence of the men who proposed to build and operate the road. The Canadian Pacific is today one of the most successful lines of railway in the world. Hence, when other propositions are brought forward looking to the opening up of new territory, criticism loses its edge. The optimist points on one hand to the ever-swelling tide of immigration, more than half of it made up of sturdy and acclimated Americans, and on the other to the experience of the Canadian Pacific.

Adequate transportation facilities constitute Canada's chief need at this moment. The country is developing faster than railways can be built. In addition to the Canadian Pacific, which is the only line on this continent stretching from the Atlantic to the Pacific, the Grand Trunk Pacific is being constructed as a parallel, and the Canadian Northern will soon form another. The federal and provincial governments have extended a generously paternal hand to these latter, as they have to all lines, until today the account of aid in one form and another runs well up to the $700,000,000 mark. No other country in the world has done so much to provide railways, nor done it with such hearty cheerfulness. No other country seems prepared to do what Canada still has in view for

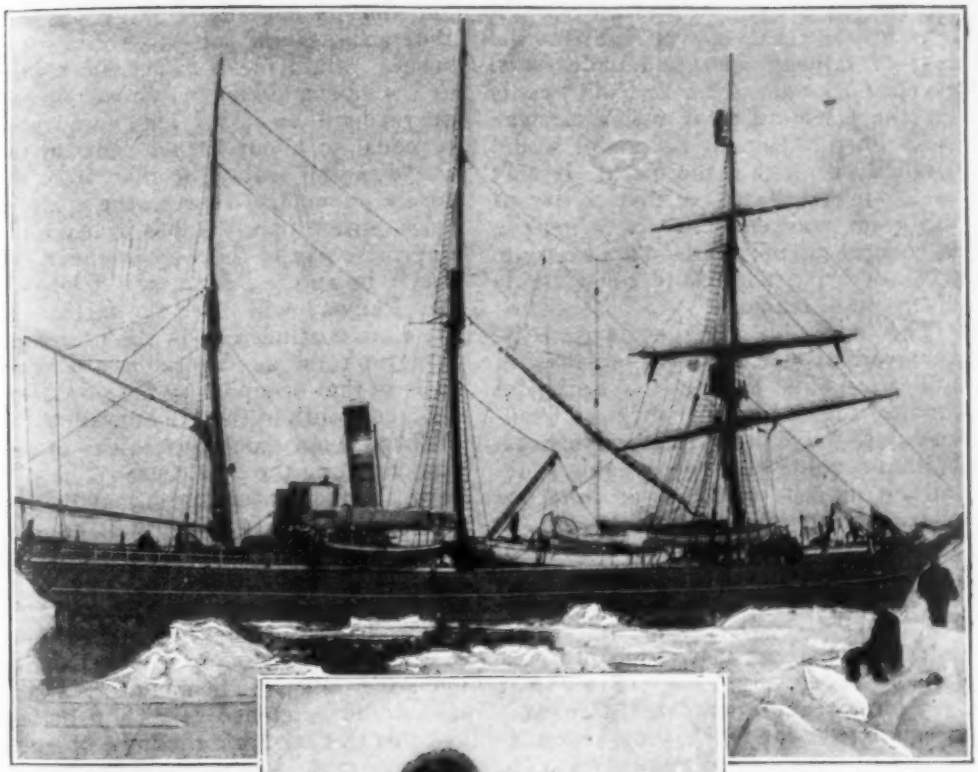
the solving of transportation problems. The idea of building a railway from some point in western Canada to Hudson's Bay is not a new one. Geographical considerations have long suggested it. Such a project was first mooted in the early eighties, and had for its principal advocate Mr. Hugh Sutherland, of Winnipeg. Mr. Sutherland was then a member of Parliament, sanguine and persistent, and he gave up practically ten years of his life to the promotion of this scheme. He first secured from the legislature of Manitoba a bonus of $1,000,000, to which was attached the condition that the road should be completed within five years. That was in 1885. Capital was shy, however, and in the following year the offer of assistance was changed to a guarantee of four per cent on $4,500,000 for a term of 25 years. Even this was insufficient to attract money to the enterprise. Later, the Dominion government held out a subvention of 12,800 acres of land and $6,400 in cash per mile; but no one came forward to claim it, and despite much effort on the part of able men like Mr. Sutherland, more than 20 years elapsed without positive results.

Finally, however, the rapid filling up of the Northwest, and the congested state of the grain traffic during the years between 1904 and 1908, led to an insistent demand on the government to take up the construction of the Hudson's Bay Railway as a public work. The government, already heavily involved in the building of the Grand Trunk Pacific, nevertheless promptly shouldered this new burden, and now stands committed to the policy of providing a railway to Hudson's Bay with all possible expedition.

There are no serious or insurmountable physical obstacles in the way of building the road. Two routes have been surveyed by government engineers; one to Fort Churchill and the other to Fort Nelson. The latter will probably be adopted, because, among other reasons, it leads to the better harbor. The line will start from a point on the Canadian Northern Railway, called The Pas, and run northeasterly to Hudson's Bay. To Fort Churchill the distance would be 477 miles, and to Fort Nelson, 410. When built, it will be a unique railway, in that it will not be operated for more than four months in the year. This element of novelty is quite unavoidable, since it is definitely known that the navigation of Hudson's Straits is rendered inpracticable by ice during, at least the eight months between November 1st and July 1st. At large cost, and as the result of prolonged observations, that much has been ascertained.

The peculiar conditions under which the new railway must be operated, were not overlooked when the government took up the matter. The call of the wheat fields was, however, imperative. A glance at the map will show that for northern Manitoba, the whole of Saskatchewan and part of Alberta, a short and natural highway to Liverpool is afforded by Hudson's Bay. By that avenue the chief market of Europe is nearer by several hundred railway miles than by way of the great lakes and the St. Lawrence. Distance is not always a governing factor in the regulation of rates, particularly by water; but it would seem that the proposed new route would at least effect a considerable saving on grain for export from the territory which the railway is intended to serve. A single trans-shipment, instead of two, figures in this estimate.

To understand the purpose of the Hudson's Bay Railway, it is necessary to know the existing situation with regard to transportation in western Canada. Saskatchewan is essentially a wheat-producing province. The southern and western portions are fertile, but the northwestern area is not so well adapted for farming. It contains many lakes and muskegs or bogs. Into the arable districts a rising volume of immigration is flowing. This means an increasing wheat area. In 1908 the acreage was 2,396,000; this year it is 4,848,000. Every cent per bushel which the settlers may gain in their selling price is important when



S. S. "Diana," Which is Making Surveys at Proposed Terminals in Hudson's Bay—Photograph Taken on June 24 of This Year.

multiplied by millions. At present more than 80 per cent of all grain sent abroad is brought down by the railways to Fort William, whence it is carried by vessels to tide-water. Winnipeg is the center at which the wheat is assembled in car-loads, and the distance from that point to Fort William is 426 miles. It costs ten cents per hundredweight to transport the grain to the head of navigation. The water journey from Fort William to Montreal is 1,224 miles, for which a rate of about 9 cents prevails. Through all the intervening canals vessels pass free of tolls. From Montreal to Liverpool, a distance of 2,760 miles, the charge is slightly over 6 cents. That is to say, wheat is delivered in Liverpool from Winnipeg at a cost of about 25 cents per hundredweight.

Husband and Wife—Types of Eskimos at Fort Churchill—Man in Winter Dress

From Winnipeg to Fort Nelson, a haul of 900 miles,

the freight charge would likely be not less than 18 cents, having regard to the cost of railway operation under such exceptional conditions. To add 7 cents for the 3,300 miles of water carriage from Fort Nelson to Liverpool would probably be within the mark. It may be assumed, therefore, that so far as the great market center of Winnipeg is concerned, the Hudson's Bay route will not bring about any considerable diversion of traffic.

The situation changes materially, however, as one proceeds northward. For all points beyond the center of Manitoba it is obvious that the new railway will have a distinct advantage. Without going into geographical details, it may be said that an immense district lying in the Provinces of Alberta, Saskatchewan and Manitoba, representing a wheat-growing area equal to the States of Dakota, Minnesota, Wisconsin, Nebraska and Iowa, will naturally become tributary to Fort Nelson on Hudson's Bay. From that very large section of western Canada it is estimated that wheat may be transported to Liverpool at from two to six cents less per hundred pounds than by way of the St. Lawrence. If experience sustains this expectation, it may be taken for granted that the Hudson's Bay Railway will serve the precise end which the Dominion government has in view.

It is interesting, however, to observe the physical bases of this expectation. It has already been pointed out that the railway can be operated for not more than four months in the year. The grades being not more than 21 ft. to the mile, it is assumed that pay loads of at least 4,000 tons may be hauled. This implies locomotives of the Mallet articulated compound type, large cars, heavy rails and general equipment to match. Sixteen trains per day for 30 days, making allowance for delays and accidents, would represent the delivery of 64,000,000 bushels of wheat at Fort Nelson per month. The total volume which could be carried over a single track system would probably not exceed 200,000,000 bushels each season; but that is actually a large amount, and, at a saving of three cents per bushel, would mean $6,000,000 a year to the husbandmen in whose interest the road will be built. That sum would be equal to about 25 per cent on the whole capital outlay; so that, from the purely monetary aspect, the government quite properly hopes to make the enterprise pay in the way intended. To put it in another form, the Hudson's Bay Railway will place the farmers of the district alluded to in the preceding paragraph on as favorable a market basis as that occupied by the producers of wheat south of the 52nd parallel.

There is not much probability of settlement along the new route. The surveyors found timber, and it may be that valuable wooded areas will be discovered by prospectors on the uplands away from the main course. The country is not, speaking broadly, suitable for agriculture. Several expeditions sent into Hudson's Bay by the Dominion government have definitely ascertained the existence of rich fisheries, and this fact suggests the hope of some traffic inward. There is also the expectation that cattle may be shipped out by the proposed line, and coal from Nova Scotia and general merchandize from Great Britian for the fast developing west be brought in; but the sole purpose immediately aimed at is to carry out wheat. Local business is not looked for, and it does not seem likely that a passenger car will ever run over the rails.

Here, then, is a railway in process of construction which will, in several important features, make it unlike any other road in the world. It will be first class in every respect, and will cost $25,000,000. It will carry freight only, and, to a large extent, in one direction. It will be entirely idle for at least eight months in the year. It will be built specifically to transport wheat, and the object of the Canadian Government will be fully served if it saves three cents per bushel to the producers of the West. It may save more for the farmers of a certain section; but that figure represents a fair average of the possibili-

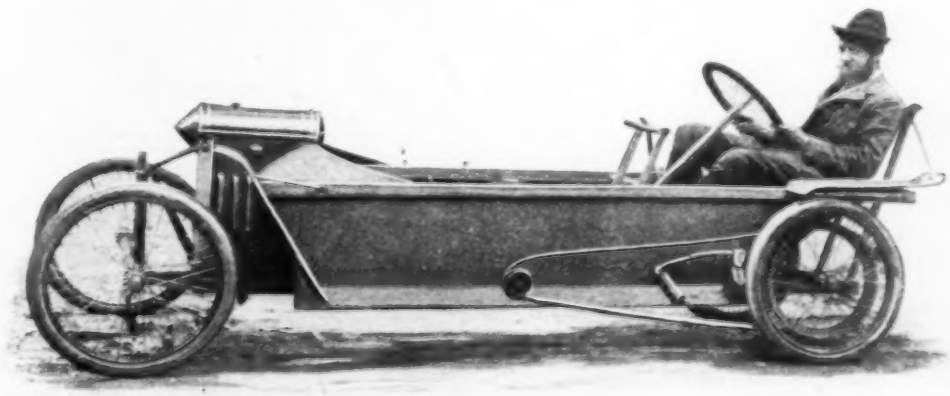
ties according to the estimate of experts. The rates will probably be based on the bare cost of maintenance.

Such an enterprise fairly indicates the disposition of the Canadian people with respect to their basic industry—agriculture. The Dominion has already laid out $100,000,000 on its inland waterways for a corresponding purpose, and contributes more than a million a year toward their maintenance. In this way, the disability caused by distance is in a measure overcome. Abounding prosperity and a steadily enlarging public revenue make such projects practicable without creating an unbearable burden. As the possessors of the last great West, and filled with faith in its potentialities, the citizens of Canada are seeking to provide the facilities for a commerce which has expanded marvelously during the past decade. This year it may mount up close to the billion mark. Measured by population, no other country under the sun is in a similar position. By the same standard, Canada has the highest railway mileage. Territorially it has the lowest.

In providing an outlet through Hudson's Straits, the Government of Canada is merely making use of an avenue which is associated with the cradle days of American commerce. It was on the shores of Hudson's Bay that the company bearing that name set up its primary posts 240 years ago. While Quebec was being fortified and New Amsterdam was but a hamlet, the pioneers of the fur trade were laying the foundations of their empire at the very point where it is now proposed to locate the eastern terminus of a great railway. It was not until two hundred years later that a botanist, who still survives, declared that wheat could be grown in Prince Rupert's Land, at that time the domain of the Hudson's Bay Company.

AUTOMOBILE TO SUIT NEEDS OF INVALIDS

M. Bordelai, the French engineer, has designed a special motor car for invalids and convalescents. The necessity of daily drives in the fresh air for his grand niece, to hasten her recovery from a severe illness, was the incentive to the invention. The machine looks somewhat like a bathtub on wheels and has a long, low wheel base, with deep tonneau to prevent upsetting. The seat, at the extreme end of the car, has a very comfortable back, and the steering wheel is provided with a long shaft which the operator can handle without changing his comfortable position or tiring himself.



Comfortable Motor Car for Invalids

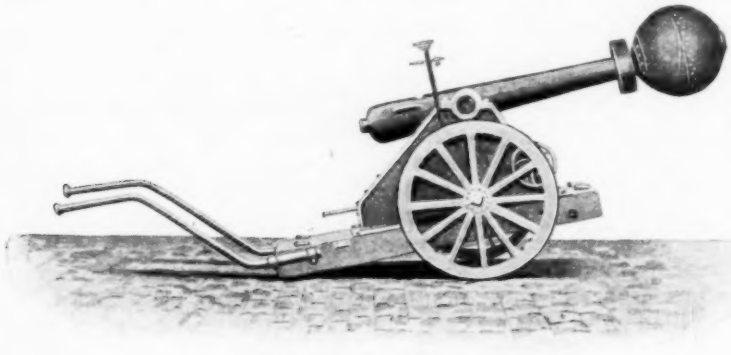
ELECTRIC IRONS USED FOR REPAIRING FURNITURE

It may be possible for the housekeeper of the future to iron out the scratches and dents in her furniture as she does the creases and wrinkles in her clothing. By the use of an electric iron and a specially prepared paste, a firm of New York furniture manufacturers are now able to do all manner of minor repairing of this character, economizing thereby in both labor and material. The process simply requires the filling of the crack or nick with paste, after which an ordinary electric flatiron is passed over the spot thus treated. This causes the wood to swell, and the rubbing or smoothing with the iron restores the original surface. The result is that the damaged piece of furniture regains its original finish.

Ironing Cracks from a Damaged Armchair

NEW GUN TO FIRE POISONOUS-GAS BOMBS

Stinkpots and Greek fire, as means of defense and attack in more or less ancient wars, were long ago discarded on the presumption that they were antiquated and useless, yet a great European power is now experimenting with just such projectiles.



Modern Projector of Stinkpots

Method of Mounting Bomb for Discharge

A bomb that discharges flaming liquid over the surface of the water has already been described in these pages, and the device now illustrated is a modern stinkpot, made by the Krupps. It is a shell containing 160 lb. of powder, which, on exploding, fills the air with death-dealing gases. The gun from which the bomb is fired is of the ordinary small bore.

The shell is loosely mounted on a rod, as shown by the drawing. The rod is provided with an enlargement at its inner end which fits snugly into the bore of the gun, while the ring on the rod just below the bomb fits over the muzzle. The propelling charge is placed in the gun in the usual way, then the rod is inserted into the muzzle. When the gun is fired, the rod is projected from the muzzle, but when the enlarged lower end strikes the ring at the muzzle a shock results, which lessens the velocity of the rod, while the bomb continues on its journey separated from it. At an elevation of 45 deg., the bomb travels about 1,500 ft. with destructive effect, while the rod and ring fall at a short distance.

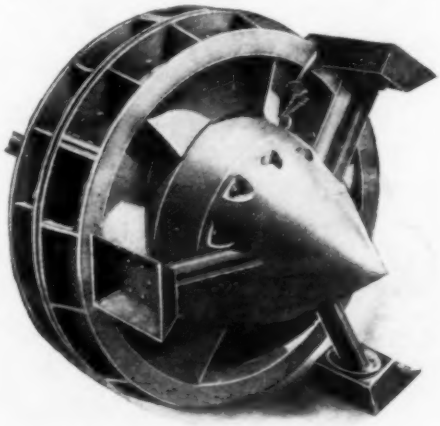
The short range of the bombs limits their use, of course, to engagements at close range, but it is believed they will be very effective in repelling attacks on such defenses as field trenches and breastworks.

CHINESE VERMILION MAKERS HOLD SECRET OF AGES

The manufacture of vermilion, which is one of the foremost industries of Hongkong and entirely in the hands of the Chinese, is very ancient. They made artificial cinnabar long before Europe was a civilized country, and some of the granite stones between which the pulverized ore is ground are almost prehistoric. Even in the present day there are trade secrets in the industry which no European has been able to fathom. There are over one hundred of these plants in Hongkong and Kowloon.

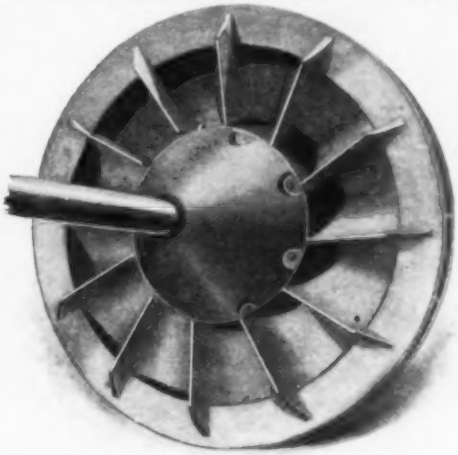
POWERFUL PUMPS FOR DRAINAGE SYSTEM

The completion of the North Shore pumping station for the Drainage Canal at Chicago involves the installation of four horizontal screw pumps, the largest of their kind in the world.



Suction Side of One of New Chicago Screw Pumps —Capacity 250 Cu. Ft. Per Second

The North Shore station, located near the suburb of Wilmette, is designed to pump water from Lake Michigan, and to pump the sewage of the northern sections of the city to the drainage



Discharge Side from Which Water Will be Forced into Drainage Canal—Pump is 9 Ft. in Diameter

canal and thence to the Desplaines river. There will be four pumps in the new station, each of which will have a capacity of 15,000 cu. ft. per minute against a head of 3 ft. when running 75 revolutions per minute. Each pump will be driven by a 150-hp. three-phase, 60-cycle, 2,300-volt induction motor. The shafts will extend horizontally into the motor room. The station will be about 400 ft. from the lake.

DESTROYER "PAULDING" HAS SPEED OF TRAIN

The new oil-burning destroyer "Paulding," which has just been turned over to the Navy Department, is the fastest boat in the American navy, having attained a speed of 32.8 knots on her trials in September. The "Paulding" attained a speed of 33 knots during one 15-minute period of her trials. Her sister ship, the "Drayton," is now ready for speed trials and it is expected by the contractors that she will be as fast as the "Paulding." The "Flusser" and the "Reid," the two new coal-burning destroyers, were the speediest vessels in the navy prior to the tests of the "Paulding." They were accredited with 30.46 and 31.86 knots respectively.

KING OF SPAIN INSTRUCTOR IN CYCLING

King Alfonso XIII of Spain, in addition to being a thoroughly modern

King Alfonso and His Bicycle

young man, is taking upon himself a part of the training of his infant son, the crown prince. He intends that the boy shall have all the out-door life possible, to guard against the weaknesses that constantly threaten his father. With this idea in view, he is familiarizing the young prince with all sorts of sports. Bicycling is one of the things the king believes the boy should learn and, being himself an expert, has undertaken to show his son just how he should ride.

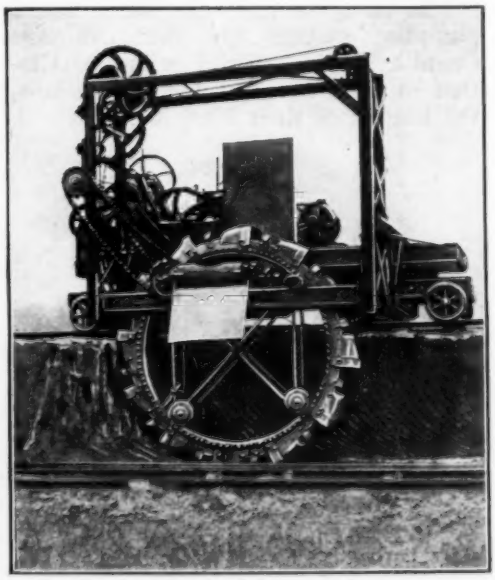
A picture of Alfonso astride a wheel, recently made in the palace gardens at San Sebastian, is considered unique in the portraiture of royalty.

REFRIGERATED AIR FOR BLAST FURNACES

Refrigeration as a means of increasing the output of blast furnaces and reducing the fuel consumption is being used with remarkable efficiency in several plants. In one instance, the use of a refrigerating machine in drying the air for the blast raised the output of the furnace from 350 tons of iron per day to 450 tons. At the same time, the consumption of coke was reduced about 300 lb. per ton of output, the air required for the blast lessened in the ratio of from 40 to 34, and the indicated horsepower of the blower lowered from 2,700 to 2,000. The saving of horsepower alone was sufficient to run the refrigerating machine, which produces 250 tons of refrigeration per day; and the additional savings were large enough, it is said, to leave even a margin of profit on the first cost and maintenance.

CLAY DIGGING MACHINE

A clay digger used successfully in fairly level clay fields is here shown. The excavating wheel has no axle, but revolves upon anti-friction wheels placed just outside its rim. As the excavating wheel revolves, each bucket cuts off a slice of earth, and dumps it onto a belt conveyor near the top. The illustration shows the excavator as used where the clay is worked in terraces 5 ft. high. The cars, into which the clay falls from the digger, run on a track on the terrace below the digger.



Digging Clay in Terraces

When the clay pit is not deep and the clay is solid and hard, the machine is run on wheels as a traction engine.

First Plowing on Reclaimed Land Three Months After Water Was Pumped Off. Land Was Covered With 10 to 30 Inches of Decayed Vegetation

Reclaiming the Vast Marsh Lands of the Delta Region

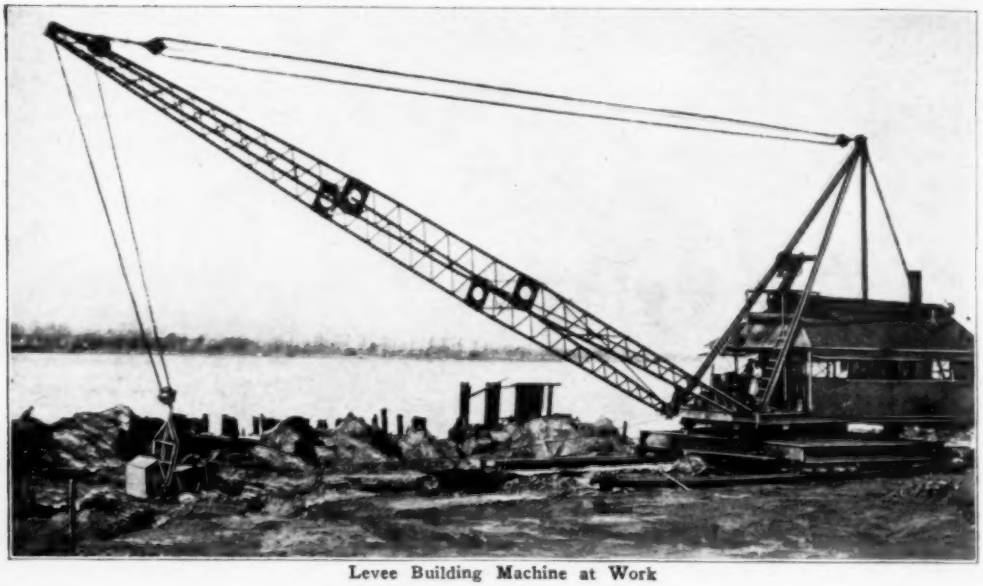
By LOUIS A. DODGE

WHILE the eyes of the speculative and commercial world have for years been turned toward the vast projects of reclamation of arid lands in the far West, attention is now being directed to projects in the lower Mississippi Delta where millions of acres of land are being reclaimed.

There is a vast difference, however, in the means and manner of reclamation. In the West, the plan is to get the water on the lands; in the South, it is to get the water off the lands. Were it a question of irrigating the lands being reclaimed in the lower portion of Louisiana and Mississippi, the proposition would be simple. It would only be necessary to tap the vast Mississippi River and an abundant supply of water would be obtained at very little cost. But the work to be accomplished in southern Louisiana and Mississippi is to get rid of the surplus water and drain the lands.

It is the dream of those interested in the project to make the territory adjacent to New Orleans the corn belt of the United States. This may startle the farmers in Kansas, Illinois, Nebraska, Iowa and other states, but figures show that Louisiana, at least, is growing fast as a corn-producing state. In 1908, it produced 31,198,000 bushels and in 1909, 51,198,000 bushels, an increase of 60 per cent—a greater percentage increase than any state in the Union. The crop for this year is expected to be 75,000,000 bushels. Not only will corn be the product of reclaimed lands, but almost every known product except possibly apples and wheat can be grown.

Not only will the farmers of the middle and western states realize soon that swamp reclamation is bringing forth a strong competitor, but when the facts are known, they will look upon the Mississippi river and its northern conflu-



Levee Building Machine at Work

ents as great thieves, for the rich soil that covers the sub-soil in the wet lands of Louisiana and Mississippi was stolen from the hills and plains of the states through which the rivers flow and deposited in the lower delta to mingle with the decayed vegetable matter of ages and create as rich a soil as exists in the world.

Take a map of Louisiana and draw a line across the state through Lake Pontchartrain, Donaldsonville and Lake Charles and below this, more than 11,000 square miles, is an area of land much of which for years was looked upon as worthless and classified as swamp land. Yet part of this land in the vicinity of Houma and Thibodeaux has a natural drainage, and the remainder, the greater portion by far, although lying below tide level, can, at a cost of about $20 per acre, be drained

A View of a Levee Along the Mississippi

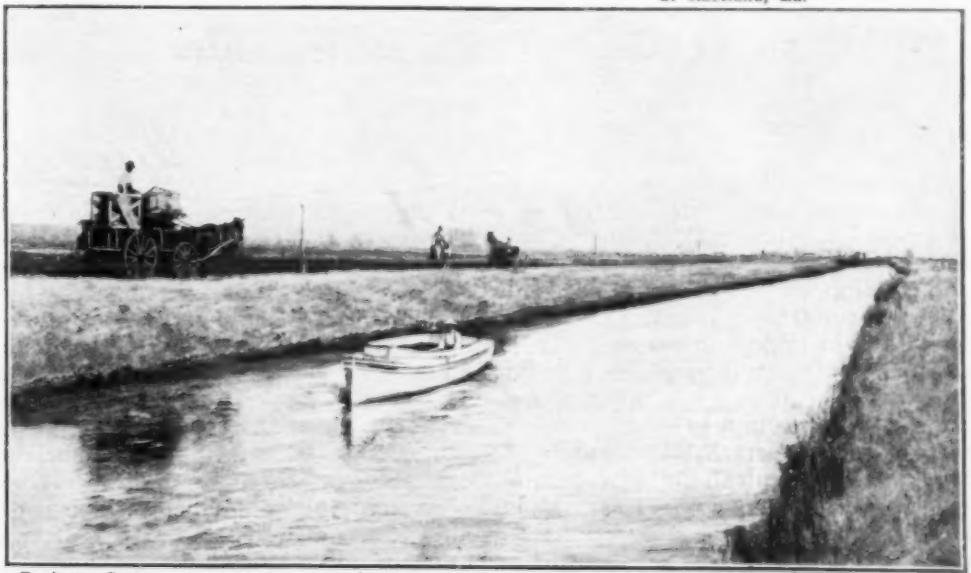
and made into highly productive fields. Fringing this land is a length of sea coast lapped by waters that produce some of the finest fish and oysters of the world. Running through the area is the Intercoastal Canal under construction by the government. Within the tract is produced the great rice crop of Louisiana, almost two-thirds of the sugar, 60 per cent of the cypress and about 70 per cent of the commercial truck farm products of the state. Within its borders are located great salt and sulphur mines.

There has been some criticism that the government should spend millions to reclaim arid lands in the west, far from the centers of population, while nothing has been spent to reclaim wet lands, of many times the productive capacity, adjacent to the points where millions of citizens have resided for centuries.

Reclamation will, it is believed, also change the social and political condition of the South. Where in the past vast areas have been owned by the sugar and cotton kings, the small and independent farmer with his few scores of acres will step in and be the controlling factor of society.

The processes of reclamation in op-

Sod Corn, 71 Days After Planting on Reclaimed Land at Raceland, La.



Drainage Canal on Reclaimed Lands of Louisiana. Canals Furnish Water and Transportation Through the Southern Part of the State to New Orleans Market and to Gulf—This is the Holland of America

eration are most interesting. First the vast tracts are divided into districts of from 1,000 to 5,000 acres. Then around each district a main canal is dug 8 ft. deep and 40 ft. wide. The earth from the canals is piled into an embankment or levee surrounding the district. As the rain fall in Louisiana amounts to about 60 in. per annum, the problem is only to get rid of the surplus. The maximum variation of the water level is about 3 ft. and the embankments are usually built to a height of 5 ft. It has been found that canals of the dimensions mentioned, with their lateral ditches, are sufficient to take care of a rainfall of 2 in. in 24 hours.

Pumps operated by steam or gasoline remove the water from inside the levees and into the canals or nearest waterways. Lateral ditches are dug at intervals of 1,300 ft., and are 8 ft. wide and, sometimes, when necessary, there are sub-lateral ditches dug 300 ft. apart.

Notwithstanding the heavy rainfall, it has been found by experience that it is only necessary to operate the pumps about 30 days of a year, the lift being from 3 to 6 ft. Sometimes instead of a pump, a wheel operating in a sluice, like an undershot wheel, but traveling in an opposite direction, is employed. This wheel pushes the water over the levee, through the sluice, and drains the area. The average cost for a pumping plant and the digging of ditches has been estimated to be about $20 per acre.

It might be said that every acre of land in southern Louisiana, including the City of New Orleans, is reclaimed land. For the construction of the vast system of levees along the Mississippi was really the beginning, and the numerous levees surrounding the reclaimed areas of swamp lands are practically a continuation of the system. For years, New Orleans was referred to in state correspondence between England, France and Spain as the "Island of New Orleans."

So far the swamp land reclamation is in its infancy, as the area to be reclaimed is much greater than that reclaimed. The projectors are getting an average price of about $65 per acre for the reclaimed land—land that some 50 years ago was deemed practically worthless and was frequently sold at a price of 25 cents or less per acre.

AN AERIAL FLEET FOR THE ARMY

By L. WILLIAM THAVIS

Congress will be asked during its next session to authorize the formation of a battalion to be known as the Areo-Wireless Battalion, which is to be a part of the U. S. signal corps. This organization will be composed of four companies of 150 men. The men will be trained in taking observations from balloons and aeroplanes, and also in dropping of explosives, while the air-ships will be equipped with wireless apparatus in order that there may be constant communication between the occupants and the coast forts. It is understood that the corps will be started with at least three dirigible balloons and 15 or 20 aeroplanes. This, it is claimed, will necessitate an outlay of about $600,000.

The officials of the War and Navy Departments feel that recent developments in aviation have proved to Congress the necessity of keeping abreast of the other nations. It has been calculated by some of the experts in the Navy Department that the aeroplane is seven-tenths less dangerous to the crew than is the submarine.

There have been advanced by officials of both departments the following reasons why the aeroplane may be preferred to the submarine as the means of attacking battleships, and may be used to attack fortifications on land:

1. That ordinarily not more than two deaths can occur at the time an aeroplane is disabled and crashes down.

2. That this number cannot exceed five; that it is recommended that military or naval aeroplanes for purposes of offense be limited to a crew of three men, including the driver.

3. That a parachute, as a complement of safety, offers no little advantage to the aeronaut who must resort to it, and that its use ever since aerial travel has been attempted has proved its value.

4. That the aeroplane offers a slight body for attack; that unless it hangs low, it is unlikely that damage sufficient to drop it can be inflicted upon it with a projectile.

5. That invulnerability of the driver or crew can be encompassed by means of a protective steel plate beneath the men, and that its weight, based upon its length and width, need not be great. It is estimated that an oblong steel plate, 3-10 in. thick, 5 by 7 ft., will deflect a well-directed shot.

6. That smaller and lighter plates can be attached to an aeroplane, manned by a driver who is a skilled artilleryman, in case of rapid and hasty destructive action against the enemy's ship or fort.

7. That those in an aeroplane are better informed than those in a submarine, because they can hear and see, and are less likely to run against an obstacle at the risk of their lives.

IMPROVED BRITISH MINE RESCUE APPARATUS

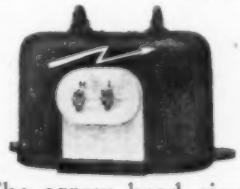
Experiments at the Lancashire and Cheshire Miner's Rescue Station, Atherton, the first station of its kind in Great Britain, have developed a rescue apparatus with which it is said that the men so equipped can work for five or six hours in the most deadly gases, without the slightest inconvenience or exhaustion.

The weight of the apparatus is 28 lb., but nearly all this weight is borne by a belt around the waist. The feature of the device is the absence of a helmet. A headpiece, provided with straps, holds the mouthpiece in position over the chin and lips, and a light clamp fits over the nose, closing the nostrils. The supply of air is drawn from the breathing bag, which hangs down from the shoulders in front, through pipes leading to the mouthpiece. The exhaled breath is carried by another pipe to a receptacle filled with caustic soda, by which the poisonous gases are absorbed. Goggles are worn to protect the eyes.

Front and Back Views of New Rescue Apparatus

DANGER SIGN FOR HIGH VOLTAGE APPARATUS

Although practically all modern electric apparatus are safe in design, it is wise to use extra precautions when in the vicinity of high voltages, and to this end a zigzag arrow has been adopted in Germany as a warning. The arrow head signifies danger, and the zigzag lightning flash is emblematic of high voltage. The danger sign is placed conspicuously on the casing of all high-voltage devices.



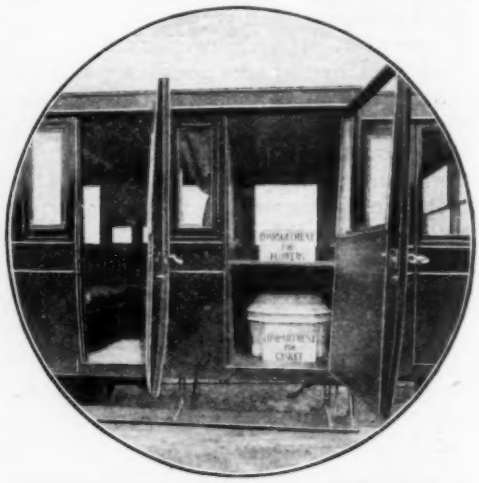
¶A French inventor claims to have discovered a process of making automobile tires of paper.

AUTOMOBILE FUNERAL COACH AND CHAPEL COMBINED

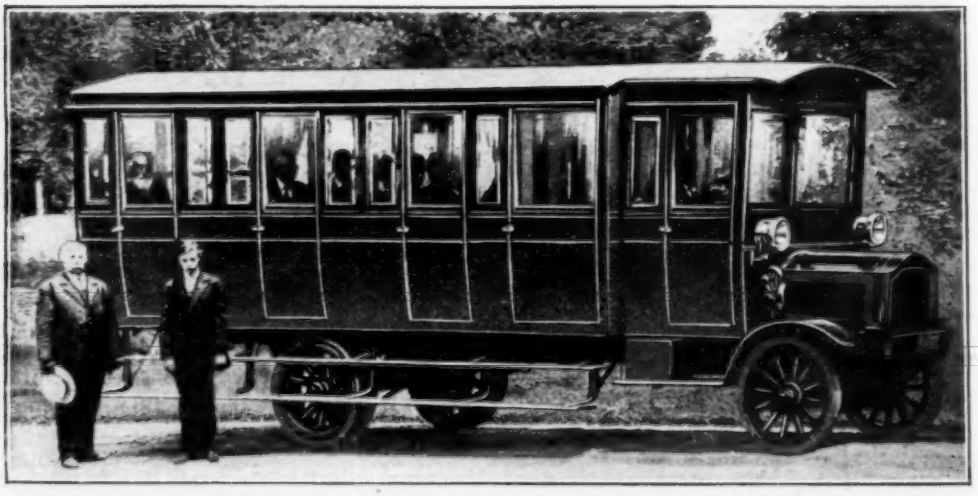
An automobile funeral car with a compartment that will seat 36 people, in addition to space for the casket and flowers, is attracting much attention in Cleveland, Ohio. The car has been used for a number of funerals and takes the place of nine closed carriages and a hearse. In bad weather it can be used as a chapel at the cemetery.

The car is 22 ft. 8 in. long and 7½ ft. wide. The compartment for the casket is 2½ ft. wide, and 2½ ft. high, while that for the flowers is 2½ ft. wide by 5 ft. high. The floor of the car rests on heavy cross sills and there are steel braces from the floor to the roof. The interior is finished in oak and upholstered in leather. Electric lights are used for illumination, the current being obtained from a small storage battery. The driver's compartment has no connection with the remainder of the car.

Interior View of Automobile Funeral Car



Compartment for Casket and Flowers



An Automobile Funeral Car Which Carries 36 People and Can Be Transformed into a Chapel at the Grave

But little more power is required to operate the big motor than is necessary for the ordinary automobile. The speed usually attained is eight miles an hour, but the engines are capable of 14 miles an hour. The wheels are fitted with solid rubber tires, and precaution has been taken to eliminate everything that will cause delay or embarrassing breakdowns. This is the only car of its kind in the world, it is claimed, and its designer is at work on plans for other cars to be used for larger funerals, either singly or in conjunction with one or more of the type now in use.

THE LAST CHAPTER OF THE FRENCH CANAL PROJECT

Using it as ballast, the government is bringing to the United States the junk left in the Panama canal zone by the French company when the canal project was abandoned. When it arrives in this country, the junk is sold by the shipload to the highest bidder. A Harrisburg steel company recently bought a shipload of the old engines and bridges abandoned by the French in Panama and is cutting it up, to be melted over into marketable steel. The accompanying pictures show some of the little oil-burning engines used by the French in Panama and some of the bridge steel made in France and shipped to Panama, but never erected there.

Portions of a Panama Canal Bridge That Was Never Erected, Now Scrap Iron—Made in France and Shipped to the Isthmus

Some of the Little French Oil-Burning Locomotives Intended for Work on the Panama Canal Projected by the French

THE COST TO BELFAST OF TWO GREAT LAUNCHINGS

An interesting side-light on the launching of the two great White Star liners, the "Olympic" and the "Titanic," is the amount of money, $300,000, the Belfast harbor board has had to expend in making the harbor facilities meet the requirements. When the shipbuilding company gave the ordinary notice to the board's engineering staff for the dredging of the basin to a sufficient depth for floating the vessels, it was discovered that the zone of the launching approached so closely as to endanger the stability of the Victoria wharf, and, this difficulty disposed of, the vessels were found to be too long to be safely turned around in the harbor. The excavation of an embankment was ordered at an estimated cost of $50,000, but the actual cost reached $150,000. Then $150,000 more had to be expended in deepening the Victoria channel to a depth of 32 ft. below spring tides.

LARGEST AUTO TIRE IN WORLD

This giant automobile tire, said to be the largest in the world, was exhibited in Detroit as an advertising feature by a tire-making concern. According to standard tire sizes, it would be a 96-in. by 12-in. tire. Its size as compared to that of a man is clearly shown.

A Giant Tire

FAN VENTILATION FOR STREET CARS

The problem of the proper ventilation and heating of street cars presents many difficulties, and although the public is continually urging improvement, but little has been accomplished.

The rejuvenated Chicago traction system is attempting to meet the demand by means of motor-driven ventilating fans, which force fresh air up through electric heaters, thus assuring a supply of warm, pure air in all parts of the cars. About 350 cars have been or are now being so equipped.

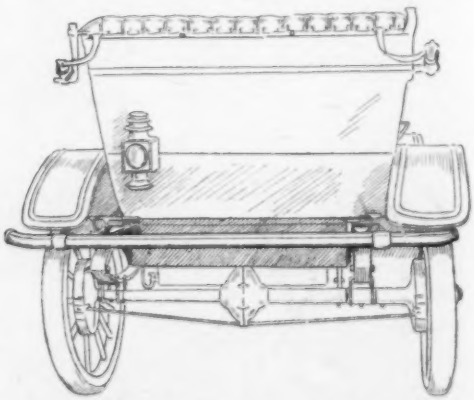
LONG-DISTANCE WIRELESS INSTALLATIONS

Several long-distance wireless stations are being installed in Africa and New Zealand, those at Figuig, Loango, Libreville, Brazzaville, and Abeshr in the Tchad region, Africa, being for military purposes. These stations will be capable of communicating with the Eiffel tower station in Paris. It is also proposed to establish communication between the French West African coast and the South American continent.

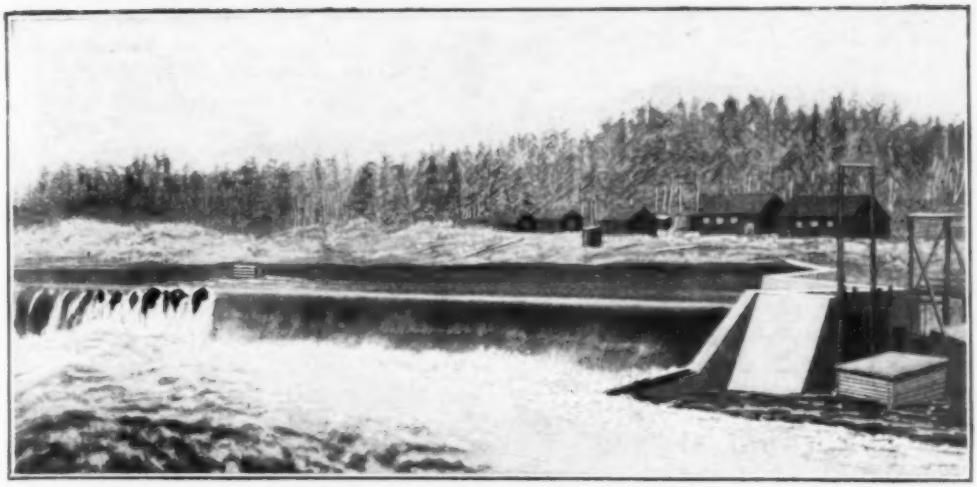
The government of New Zealand will erect two high-power and three medium-power stations, the former near Doubtless Bay, in the northern part of the North Island, and at the extreme south of the South Island. These stations are to have a minimum range oversea of 1,250 nautical miles, and will be capable of communicating with each other, and with the station of the Australian Commonwealth near the entrance to Sidney Harbor. From Sidney to Doubtless Bay is about 1,300 miles.

REAR BUMPERS FOR AUTOMOBILES

Bumpers for the rear of automobiles as well as the front are now being advocated. The rear bumper is attached to the spring hangers, and provides adequate protection for the rear axle, gasoline tank, and tail lamp.



Automobile Provided with Rear Bumper



Falls at Intake—All of Plant That Is Visible

Five Thousand Horsepower From Air Bubbles

By FRANK MAYNARD

UP in the Cobalt mining district of Canada, just eight miles south of the new mining town called "Cobalt," at Ragged Chutes the Montreal River, is an extraordinary power plant from which more than 5,000 hp. in compressed air is gained by making, capturing, and confining air bubbles. It is the largest natural air compressor plant in the world, the compression being effected by the direct action of falling water, trapping particles of air in its descent, and afterwards liberating them in a confined chamber under pressure.

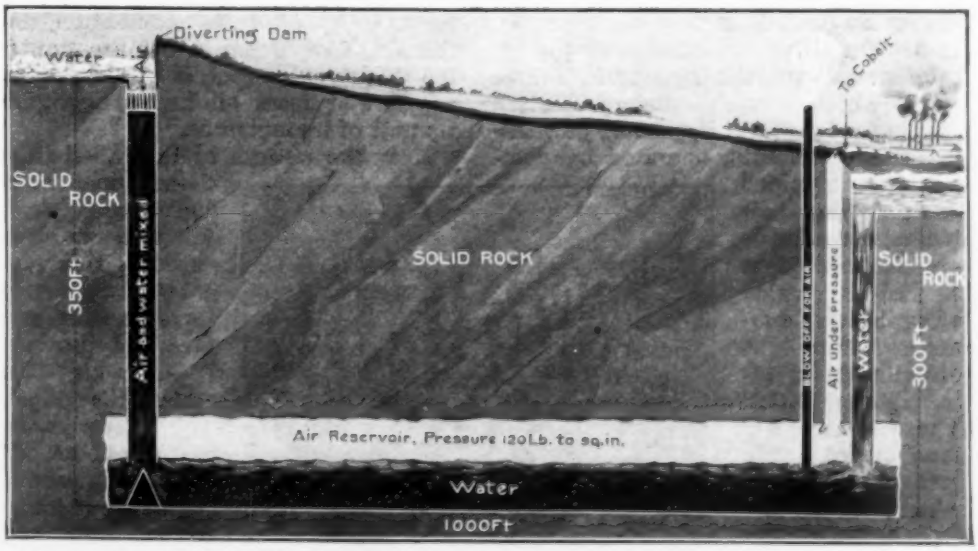
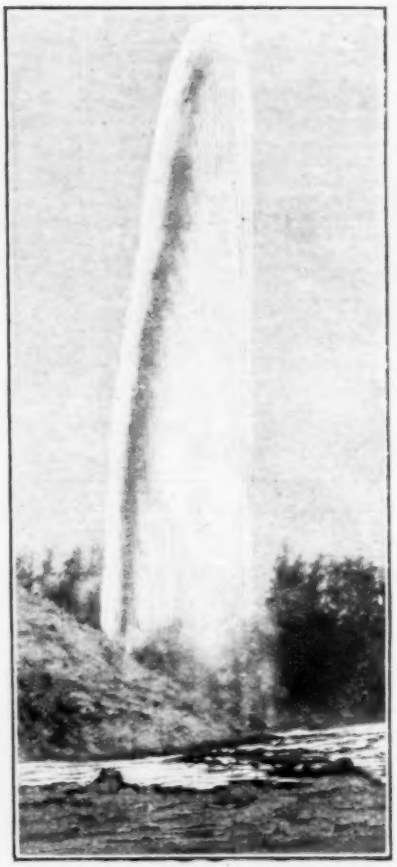


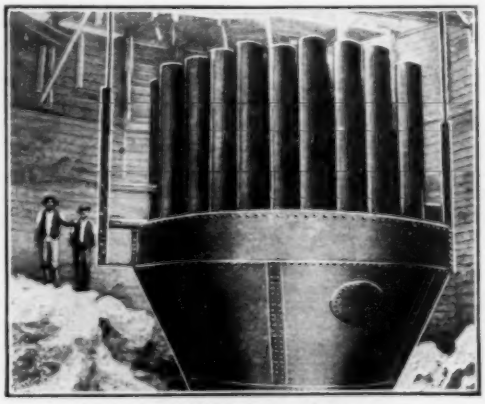
Diagram of the Plant, Showing How Air Escapes from Water into Reservoir and Is Transmitted under Pressure through Pipes

The trapping and confining of the air bubbles are, of course, two important features on which the system hinges, but a third feature, is the means by which the falling water is broken up and impregnated with more air, in finely divided particles, than the natural tumult of the fall would alone provide. This is accomplished by means of curious intake heads, 16 ft. in diameter, each of which is studded with 66 intake tubes or pipes, 14 in. in diameter. The water gulps the air down with it into these pipes, passes into a tunnel, and the air bubbles are forced to the surface.



Geyser Formed by Safety Blow-Off

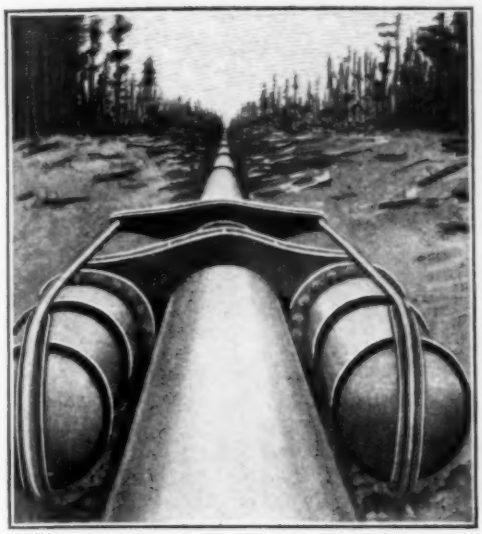
The nature of the plant and its method of operation is interesting. Stretching across Ragged Chutes is a 660-ft. dam, and there, at the intake gates, are the two 16-ft. intake heads which break up and receive the air-charged water. By means of vertical pneumatic lifts, operated by compressed air piped from the air mains, these heads are maintained at a height which slightly submerges the tops of the nests of 14-in. intake pipes. These pipes, as before stated, gulp both air and water, which, in its descent of 351 ft., becomes a mixture of water and compressed air. The intake heads, being funnel shaped, decrease to a diameter of 9 ft. at the lower ends, and discharge the water and air into pipes of that size. Some 40 ft. from the bottom of the shaft leading into the compression tunnel, however, these pipes increase in diameter to 11½ ft., which tends to lessen the velocity and liberate the air. Two steel-sheathed concrete cones receive the full impact of the water and divert it into the horizontal tunnel, which is 1,021 ft. long, following the flow of the river. This tunnel is 26½ ft. high at the intake end, 42 ft. high near the bottom of the tail-shaft, and 22 ft. wide for its entire length.



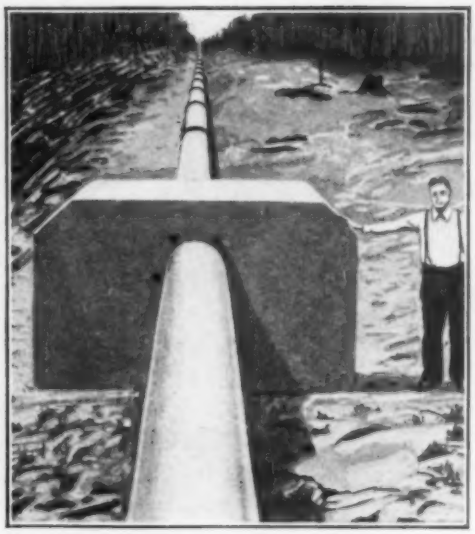
One of the Intake Heads

Diverted into this channel, the water loses momentum, and the air, now under a compression of 125 lb. per cubic foot, is freed. At this pressure it loses all but a negligible amount of its moisture.

Near the bottom of the tail-shaft, a 24-in. pipe enters the funnel from the top, and it is through this pipe that the air is forced to the surface and into the 20-in. main that serves the mines. The water races past, and, as the tunnel is smaller at this point, forms an air-tight seal that leaves the compressed air no



Expansion Safety Joints



Method of Anchoring Pipe Line

other vent. The water itself enters the tail-shaft, and overflows into the river.

The shape of the compressor tunnel and its shafts and air-pipe lines, all embedded in solid rock, 351 ft. below the surface at one point, is shown in the drawing. Just at one side of the pipe by which the compressed air is led to the surface is a blow-off or safety-valve pipe. When the compressed air is in excess of the demand of the mines, a stream of mixed water and air issues from this 12-in. pipe with an action like that of a geyser. This has at times reached a height of over 500 ft. above the level of the river.

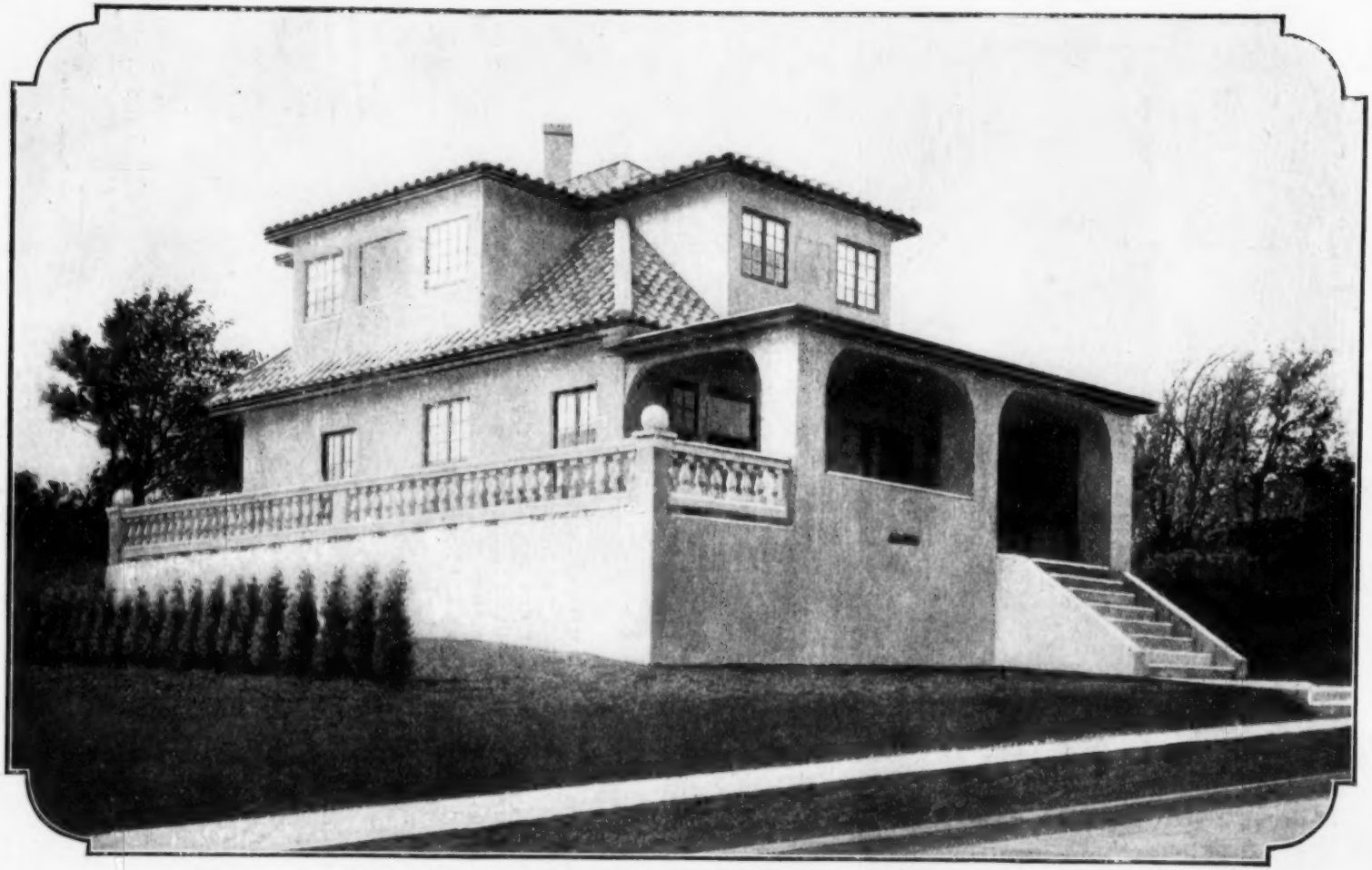
The pipe line carrying the air from this natural compressor to the mining camps is nine miles long and 20 in. in diameter, made up of 40-ft. lengths of seamless flanged steel, each length weighing 3,000 lb. Branching from this main line are two loops of 12-in. pipe aggregating a little more than five miles. To guard against the evil effects of unequal temperatures, the line is anchored to heavy concrete piers on solid rock foundation at half-mile intervals. Half way between each pier expansion pipes are provided.

The compressed air is sold to the mining companies and other concerns at Cobalt in the same manner that gas or electricity are sold in other communities. It is said that it has cut the cost of compressed air in Cobalt in two and made possible the development of dozens of properties.

Why the natural air compressor system was adopted rather than that of developing and transmitting electric current through the camp for the driving of mechanical compressors has to do with economics. One attendant can take care of the entire generating end, and the maintenance cost has hardly to be considered. There are no moving parts other than four hydraulic jacks to raise and lower the heads, and one automatic check valve, consequently there is practically no wear and tear. Also, the air so compressed is much dryer than by other means, curious as it may seem. This is very important, as there must be no possibility of the supply being cut off by reason of the excessive cold weather during the winter months.

The plant is now furnishing approximately 4,000 cu. ft. of air, under a 100-lb. pressure, per minute to the Cobalt camp.

¶Half a million tons of beet sugar was produced in the United States during the past year.



FOUR-THOUSAND DOLLAR CONCRETE HOUSE AT WATERTOWN, MASS.

House contains seven rooms, not including laundry and basement. Cost would have come under $3,000, but for expensive interior decorations.
Owned by William C. Murphy.

The Discovery of Pure Radium by Mme. Curie

By GEORGE E. LIGHT

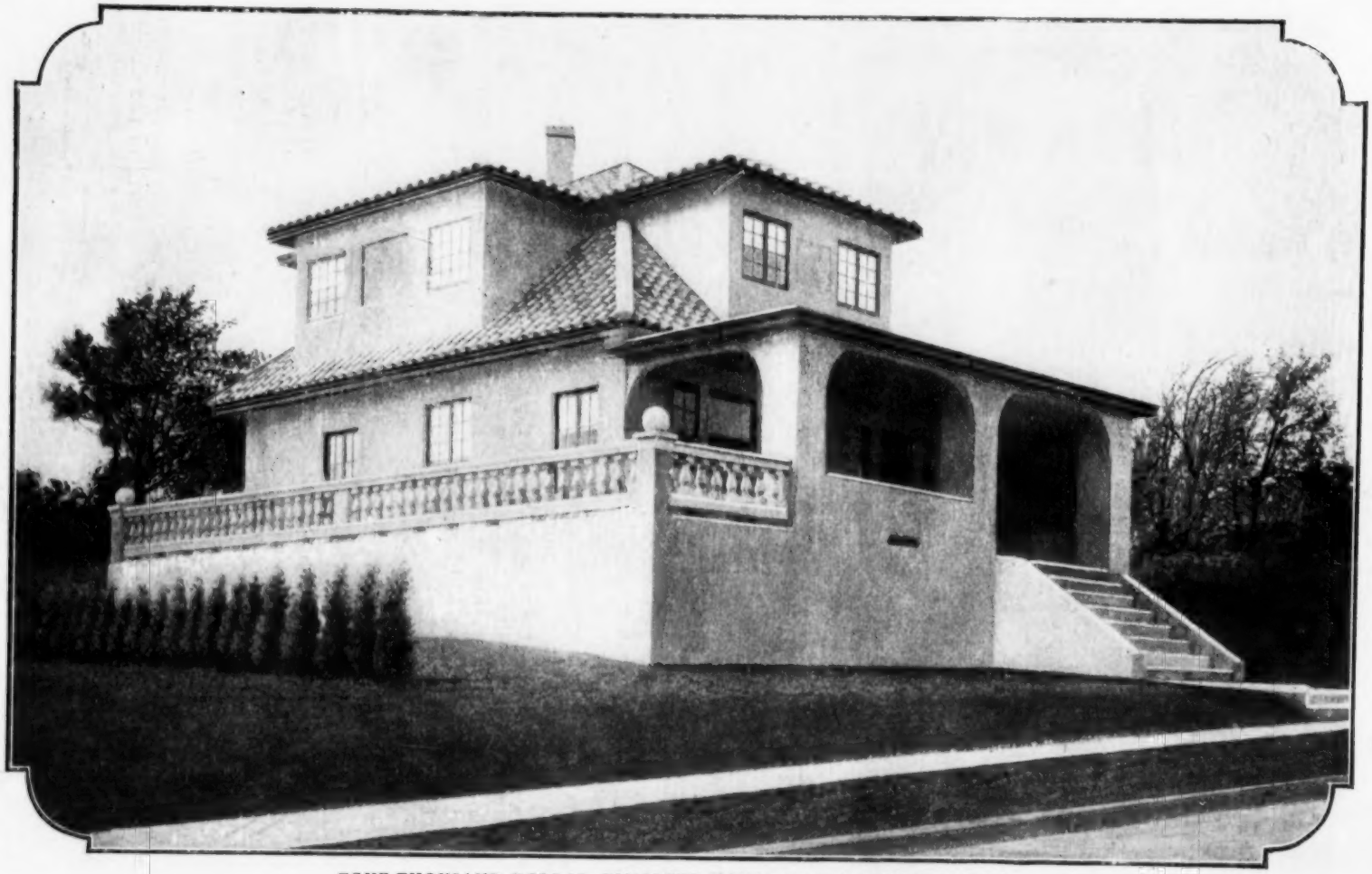
(*Paris*)

WHEN M. and Mme. Curie startled the world in 1903 by announcing the discovery of radium, it was understood by scientific men to refer only to composed salts of this mysterious metal, such as bromure and chlorure of radium, for "radium" proper, it was contended, could not be isolated. It was known to exist some years previously, but it was due to the researches of M. and Mme. Curie that it was captured in any form whatsoever.

MME. CURIE
The Acknowledged Leader of Her Sex in the World of Science

Professor P. Curie was called to his Creator soon after. But the widow of the illustrious French chemist, who had assisted her husband in his first discovery, continued the work. She was granted by the Academy of Paris and the French Government a professorship at the Sorbonne, where she could pursue her investigation and at the same time receive the financial grant which accompanied the position. By dint of much experimenting, aided by Professor Debierne, she has finally succeeded in obtaining an infinitesimal piece of pure radium in a metallic form, and the world is richer by another great victory over nature.

This strange body, which is now definitely known for the first time (unless the ancients, who were acquainted with many arts subsequently lost to mankind, had captured the metal—which is very doubtful), has a white appearance, but oxidizes very rapidly when brought in contact with the air, and quickly turns black. If it is placed on a piece of iron, it will strongly adhere to the same; it will burn paper when left upon it, and it apparently shows much energy in decomposing water. Its best prison therefore is in a vacuum, and the unique specimen which exists up to the present has been placed in a glass tube, sealed by means of a blow pipe, the air having been previously exhausted. Nothing yet is known of its other prop-



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erties, and the next study will be to trace the radio-active power of metallic radium. All that can be said for the moment is that this matter in a pure form now exists.

It was by operating on one grain and a half of salts of radium, which had previously been extracted likewise with great care, that the two scientists arrived at the result which has set the chemists of all countries thinking. This minute body was treated by amalgamation by means of an electrolytic process. The discovery was announced in a very modest manner. Although a few intimate friends were aware of the progress being made, it was only on September 6, 1910, in an official letter to M. Van Tieghem, permanent secretary of the Academy of Science, in Paris, that Madame Curie informed that august body of the great scientific work M. Debierne and herself had just accomplished. Pure radium, in a metallic state, had finally been discovered.

The effect this may have on humanity is tremendous. The salts of radium have already proven a powerful accessory in medical treatment of various diseases. The only drawback to universal use is the rarity of the metal and its cost. The market value of 1 gramme (hardly 15 grains and a half, Troy) is said to be $77,000. Cancer is treated by the means of radium, and there have been many cures. Out of 68 cases of cancer of the skin, 64 cures were effected in one hospital by the use of its rays, in three years. Large vascular tumors have been stopped, "port wine" stains and tenacious scars removed, and numerous birthmarks effaced. It is also being tried in cases of chronic rheumatism, eczema and even tuberculosis. Experiments were made on the blind, but it has not yet been shown that it can be employed in restoring sight.

The effect of the radium rays is only remarked when brought within four inches of the eye. A strange faint, pale green luminosity is then said to be apparent to some people.

As M. Curie pointed out soon after his discovery, this radioactive body possesses three fundamental properties. It emits spontaneously rays which will affect photographic plates in the same manner as light; it gives off electrized objects, and penetrates most substances. A photographic plate, even when wrapped in a piece of black paper or covered with a thin sheet of metal, is at once spoiled when placed near radium. All the magnetic power in a loadstone can be eliminated by placing a glass tube, containing radium, between the poles.

The work of obtaining the salts of radium is long and tedious. Radium is said to exist in all kinds of earth, but that of a calcareous nature is the most rich. Madame Curie has, during the past two years, experienced some difficulty in securing sufficient salts of radium for her work of isolating the pure metal. The factory at Joachimsthal, near Marienbad, Austria, is now the largest producer, the ground surrounding being quite rich in radium-bearing ore, and although this establishment owes its existence to a great extent to the discoveries of M. Curie and M. Becquerel, two Frenchmen, Madame Curie has been hampered in her research by the impossibility of being supplied by Joachimsthal. She was told that permission of the Austrian Government was necessary, and when a high personage in the dual monarchy interested himself in her behalf, the reply was given that she could not get a supply until applications previous to her own had been attended to by the authorities. The result was that Mme. Curie has had to obtain her radium-bearing ore from other sources, which has considerably hampered her in her work.

NEW PHOTOGRAPHIC GAME

The possibilities of amateur photography as a contest game have been demonstrated by the members of a country club at Lake Forest, Ill., which is the summer home of many of Chicago's wealthy people. Instead of wandering singly through the ravines,

Photographic Contest at an Illinois Country Club

woods, and fields of the colony, picture-taking expeditions were organized, certain scenes or objects were selected as suitable for photographing, and every contesting member took a picture of each. After each expedition the results obtained by each member were compared, and a committee decided which pictures were best. The winners received prizes.

THROUGH NIAGARA'S RAPIDS IN A MOTORBOAT

THE turbulent stretch of water below Niagara Falls, consisting of the Whirlpool Rapids, the Whirlpool, and Devil's Hole, was successfully navigated, part with and part without power, by a little 18-ft. motorboat on Sept. 19. The boat, the first of its kind ever to attempt such a passage, and its navigator, Captain Klaus Larsen, of Cleveland, emerged at the end of the journey without suffering serious damage, although to the thousands of watchers disaster seemed inevitable.

The boat was one specially constructed for the trip. But 18 ft. long, she had a beam of 5 ft. 2 in., a draught of 2½ ft., and was completely decked over with the exception of the small circular cockpit in which the navigator stood. Water was kept from entering the boat through this cockpit by means of a circular canvas shield, made fast to the rim of the cockpit and belted around the waist of Captain Larsen. The hull of the boat was provided with several hundred pounds of concrete ballast.

Starting from the Maid of the Mist landing on the Canadian side, Larsen headed for midstream and shot into the swift drift down the big rapids. He held the tiller rod tightly and guided the little boat well as she leaped along through the breakers.

The Whirlpool was the critical point in the hazardous trip. The staunch little craft plunged bravely into the waves and rode them like a cork. Often she appeared to be completely submerged and at other times keeled over to an alarming degree. The wisdom of the navigator in putting in a heavy ballast was demonstrated by the manner in which the craft righted when struck broadside by the waves. At one point she spun around like a top in spite of the efforts of Capt. Larsen to keep her out of the center of the pool, but the tiller was jammed over hard and the course was regained.

Although every precaution had been taken to make the boat watertight, considerable water found its way into the cockpit and under the flywheel of the engine. It was splashed over the unprotected spark plugs and caused a short circuit. This stopped the engine which up to that time had behaved perfectly.

Buffeted about in the rapids, the craft had a hard time of it, being obliged to drift at the will of the waters. The more dangerous spots were avoided with great difficulty, for the craft was swinging around helplessly.

A landing was finally accomplished at a point about a mile above Lewiston.

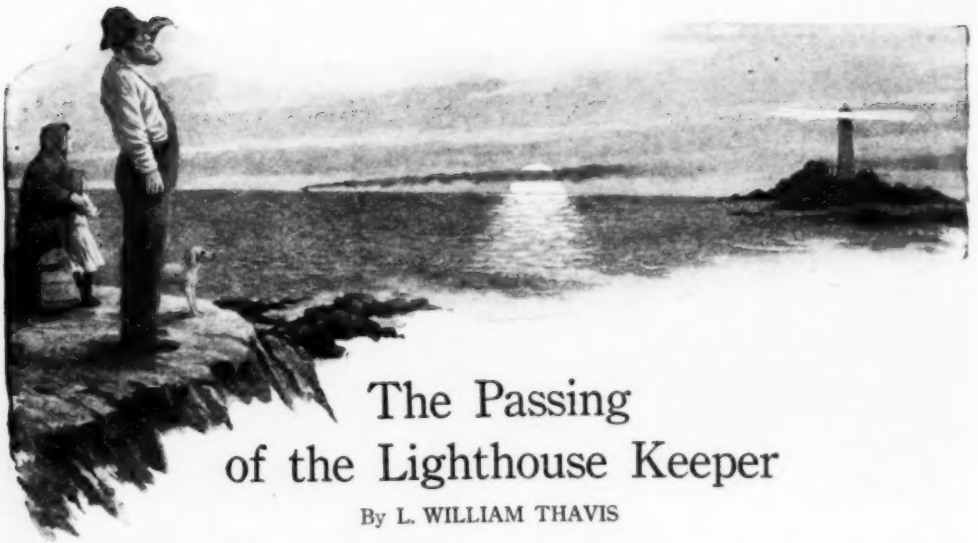
"The trip was worse than I thought it would be," said Larsen, after he landed, "but I could have finished easily if the plugs had not short-circuited after leaving the Whirlpool. The engine ran perfectly up to this point and I had the boat under perfect control. I was only in danger once, when I drifted broadside into the Devil's Hole; there it seemed as though I turned clear over. I will build another boat with more beam and power and try it again some day."

Capt. Klaus Larsen and the Craft which he Navigated through the Niagara Rapids

The Rapids

The Great Wave

The "Mauretania" clipped ten minutes from the best previous westward passage of the Atlantic on the trip which ended at New York, September 15, the time for the voyage being four days, 10 hr., 41 min. and the vessel's average speed 26.06 knots. Three days before, the "Kronprinzessin Cecilie" lowered the record from Cherbourg to Sandy Hook, her time being five days, 10 hr. and 23 min., which is 46 min. faster than the previous record.



The Passing of the Lighthouse Keeper

By L. WILLIAM THAVIS

THE adoption by the government of acetone gas, acetylene dissolved in acetone, for use of lighthouses, beacons, lightships and lightbuoys, will soon revolutionize the whole system of coast lighting in this country, and the lighthouse keeper and buoy tender will be forced to find new vocations.

For years the lighthouse keeper has been one of the most picturesque figures along our coasts. Isolated for months at a time from the world, many tales have been told of the heroism of the men who trim the lamps that guide the mariner to safety.

While the lighthouses along our coasts may be still utilized, the lights will be automatically cared for, only requiring inspection and attention at long intervals.

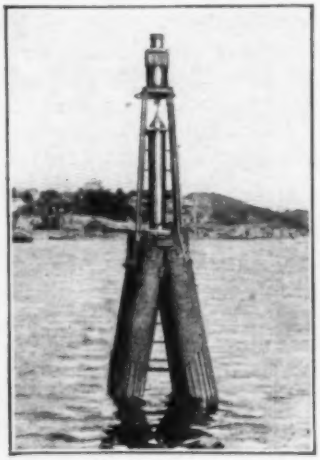
Acetylene, in its various forms, is the only commodity yet produced that will give a light next in power to that of the sun. By its use, inventions have been perfected to produce lights for a continuous period of from one to five years or more, according to the amount of fuel installed.

An Acetylene Beacon Buoy Which Has Been in Two Collisions with Ocean Liners near Greenville Pier, New York Harbor. Although Dragged Under Vessels' Bottoms, no Damage Was Done to Either Lighting or Whistling Functions

The most wonderful light in the world, and now in use by the United States government, is the one invented by Delan, the Swedish scientist. It is produced by acetone gas, and has a "human working" sun instrument containing a glass tube of several rods of varying reflective powers which automatically opens and closes the valve in accordance with the light absorbed. In other words, the light burns continuously until affected by the heat of the sun, when it goes out, only to be revived at dawn. It also contains a flashing apparatus in the lantern.

Two other types of acetylene lights have also been adopted by the Department of Commerce and Labor, which has charge of the work of

Goodyear Automatic Acetylene and Whistling Buoy—Will Burn a Year Without Attention



Pile Beacon Acetone Light—Will Burn Three Months at Cost of Two Cents per Day

Wilson Combination Gas and Whistling Buoy, Lightship Type—Emits Powerful Blasts

lighting the coasts. These are known as the Wilson and Goodyear automatic lighting and whistling buoys and beacons. The Goodyear type generates its own gas by means of a mechanical device inside of the buoy, controlled by pressure of acetylene gas, and a spring feeding the calcium to the water.

The Wilson type generates its gas also by water fed to the carbide. The action of the water at the bottom of the buoys, forced through pipes to the whistle, causes perpetual blasts of warning. The power of the whistling apparatus is about six times greater than that of the largest sized Courtnay whistling buoy.

As an aid to navigation these buoys are equal to lightships which carry crews; indeed so far as knowledge of experts extends, lightships have not as yet been equipped with as powerful lights. Mariners have observed these lights at a distance of 20 to 30 miles.

Both the Wilson and Goodyear inventions are adaptable to all kinds of coast lighting apparatus. These lights are now in use on the coast of Connecticut, in the harbor of New York City, at Cape Henry on the Virginia coast, and at Florida points which are dangerous.

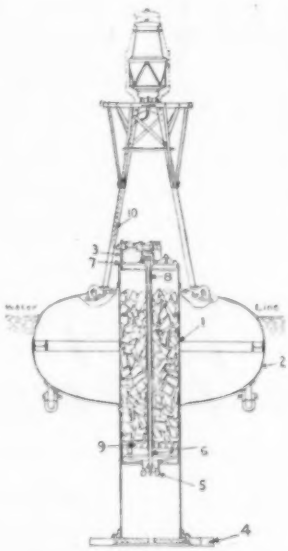


DIAGRAM OF WILSON ACETYLENE BUOY

1—Gas Generator; 2—Float Chamber; 3—Purifier Chamber; 4—Counterweight; 5—Valve; 6—Valve Stem; 7—Generator Head; 8—Guard Pipe; 9—Grate; 10—Gas Pipe

In the near future the government will replace the present lights on the Pacific coast along California, Oregon and Washington with the acetone or acetylene types. These changes, like those recently made on the Atlantic coast, will only apply to beacon, buoy and lightship lights. It will be some time before the acetylene lamp will displace the old lighthouse keeper. That change, however, is bound to come.

The general adoption of these new inventions of sea-warning lights will mean the saving of many thousands of dollars to the government annually. These "human" devices will automatically do the work of several hundred men now employed in earlier systems of lighting the paths of navigation.

Acetone gas, or dissolved acetylene, Delan's wonderful invention, is stored in steel tubes (accumulators) filled with a porous material, soaked with acetone, a volatile liquid, formed by the distillation of wood and many kinds of organic substances.

One volume of acetone dissolves 25 volumes of acetylene at 15° C, and atmospheric pressure, the solubility increasing in proportion to the pressure, so that at a pressure of 10 atmospheres, one volume holds 250 volumes of acetylene, and at 12 atmospheres about 300 volumes of the gas. The proportion of porous material and acetone in the accumulators is always fixed, so that one volume of the accumulator holds 100 volumes of acetylene at a pressure of 10 atmospheres.

Several accumulators combined form a larger gas store, capable of supplying gas for a longer time; the life of one accumulator or tube being from three to four months.

In the light apparatus, the governor reduces the comparatively high and always varying pressure of the gas, leaving the accumulator, to a constant pressure and one more suitable for the burner.

The flashlight apparatus of the Delan invention produces flashes by automatically admitting to the burner precisely the quantity of gas required for a flash, and then by keeping the gas outlet shut during the eclipse until the next flash. Existing apparatus in this line can never give more than 50 flashes per liter of gas; on the other hand, the Delan flashlight apparatus gives up to 2,500 flashes per liter. The flash can be reduced to 1/10 of a second with constant gas pressure all the time the flame is burning. The gas is never throttled, which would mean gradually reduced pressure and varying size of flame. Even during the very shortest flashes its flames are constant. The most important feature of this apparatus is a magnetic device that facilitates the instantaneous cutting off of the gas.

Simply by turning two screws, the apparatus is adjusted so as to give single or double flashes of different character.

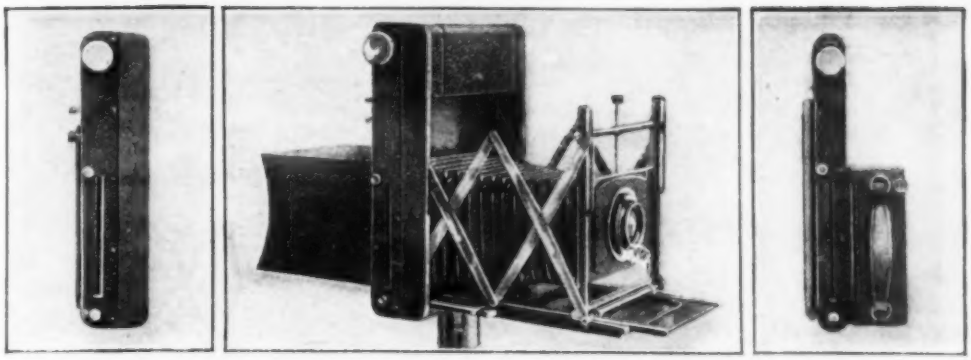
Ordinary steatite burners are used with an air supply, on the Delan system. These burners have proved very solid and reliable. The acetone gas itself possesses, moreover, some qualities that add greatly to the permanence and reliability of the burner.

The sun valve is a device facilitating lighthouses, and buoys to be automatically extinguished by sunlight. At sunrise this device, coupled between pressure-reducing valve and flashlight apparatus, closes the gas outlet. At sunset the gas is admitted again to the flashlight apparatus and to the burner. It must be accentuated that this device, the sun valve, is put into operation only by the sunlight, and that no change of temperature, storms, etc., interferes with its successful action. Tests in variable climates have shown a saving of from 30 to 40 per cent of gas.

IMPROVED GERMAN HAND CAMERA

The camera recently perfected in Germany and shown in the accompanying illustrations, is only about half as big and heavy as the reflex cameras now in use for taking pictures of the same size. The plates are carried in a magazine above the box, and the image is seen at the back instead of being reflected upward by a mirror, so that the picture is taken on the line of vision.

When the box is opened the lens springs instantly to universal focus, and the camera is ready for an exposure. The plate drops down from the magazine before the shutter moves and is returned to the magazine again after exposure. The plates are numbered automatically as they are exposed so that they can be identified during development and afterward, and there is no danger of developing an unexposed plate. Two exposures cannot



Three Views of New German Hand Camera

be made on the same plate, nor can plates be wasted by forgetting to expose or unintentionally drawing the slide when the lens is uncovered. Furthermore, if the operator has forgotten to wind the shutter or draw the slide, the camera becomes inoperative until these are attended to.

The focal-plane shutter is directly in front of the plate and a scale on the outside indicates the width of the slot at all times. As the slot has already traversed the depth of the magazine before it begins to expose the plate, it is moving at maximum speed during exposure. Nearby objects are focused upon by moving the base of the camera. The angle of view is 90 degrees. A special combination of lenses for all classes of work is employed. Instead of carrying-straps, three threaded holes are provided into which can be screwed a leather handle for carrying the camera and holding it while focusing.

"NORTH DAKOTA" ACCIDENT WILL NOT CHECK TESTS

The development of the use of petroleum as an auxiliary fuel on war vessels will not be checked despite the fire on the battleship "North Dakota," which resulted in the death of three men. The settling tank, which has a capacity of 400 gal. of oil, is, on the "North Dakota," directly over the boiler, and the ignition of oil which leaked from the tank and flowed into fire room No. 3 caused the fire. This room is under one of the magazines and the three men who lost their lives were in the room and fought the flames to prevent the heat being communicated to the explosives above them, in which event the entire ship might have been destroyed. The fire room was flooded as soon as an alarm was given and the three heroes were drowned. The men are believed to have been unconscious from burns when the inrush of water caught their bodies.

As a result of the investigation of the accident the settling tanks will be removed from the vicinity of the fire room and the boilers so that any small leakage will not expose the oil to heat sufficient to set it afire. Naval experts state that in the course of experiments of this kind accidents are inevitable and while deplorable, are not to be permitted to stop progress. It is pointed out that the "North Dakota" plant was a reproduction of the devices adopted by foreign navies and has been in successful operation on no less than 50 warships.

¶ Barney Oldfield with his Benz car established a new world's automobile record by making a mile on the Minneapolis circular track in 49 sec.

¶ The Southern Pacific Railroad has just inaugurated a freight service over its 7,600-ft. double-track bridge across the southern end of San Francisco Bay.

Fort Wayne Trolley Wreck, Showing One Coach Split Through by Heavy Interurban Car

FORTY PEOPLE KILLED WHEN TROLLEY CARS COLLIDE

Forty of the 60 passengers on an Indiana trolley car were killed and most of the survivors severely injured by the collision of an empty coach of the heavy interurban type with a lighter car loaded with pleasure seekers on their way from Bluffton to Fort Wayne to attend a fair, September 21. The empty car was moving at the rate of 40 miles an hour and the crowded car was making 25 miles an hour when the collision occurred. Misinterpretation of orders on the part of the motorman of the empty coach, who died from his injuries, is given as the cause for the wreck. The cars met on a curve near Kingsland, the empty coach plowing its way through the other car.

RESERVOIR WIPES OUT AN ENTIRE VILLAGE

There have been instances of villages being wiped out by the breaking of great water reservoirs, but in this instance a village is wiped out by the plans for the construction of such a reservoir, not by its destruction.

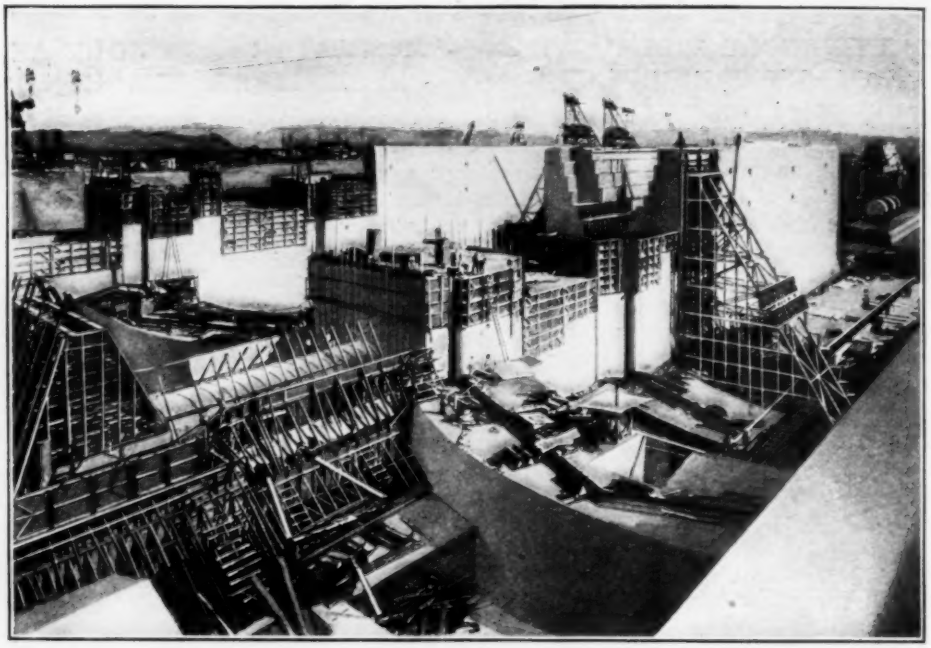
The storage reservoir is to be constructed to regulate the flow of the Black River, in Oneida County, New York, and the village to be wiped out is Hawkinsville. The dam will be an earthen embankment, 130 ft. high, and 1,500 ft. long, with a masonry spillway. The survey made by engineers of the New York State Water Supply Commission shows that the dam will hold back nearly 6,000,000,000 cu. ft. of water, creating a lake 5½ miles long and 2 miles wide.

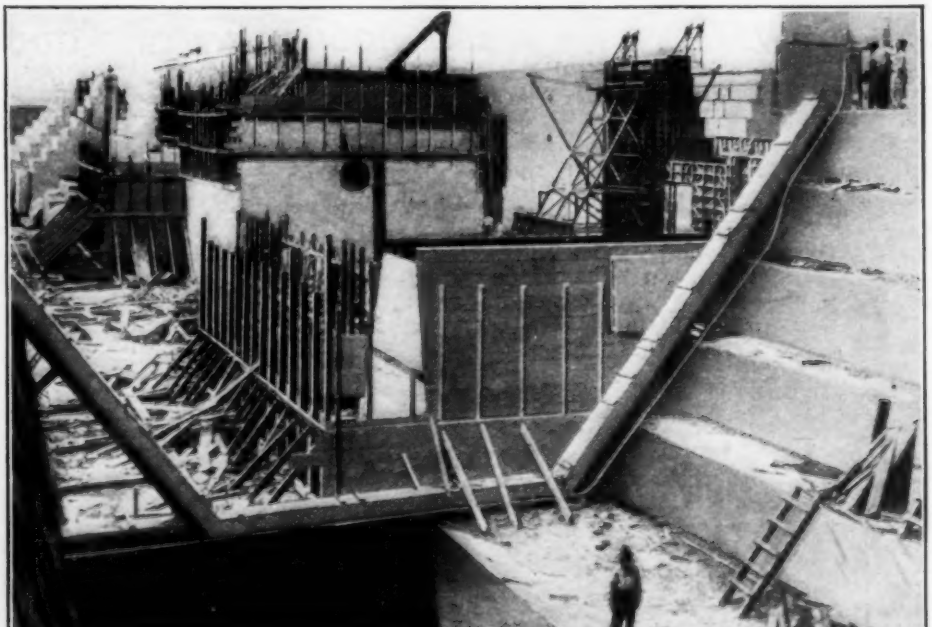
EARTH SWALLOWS A STEAM ROLLER AT ONE GULP

The citizens of Detroit were recently surprised by the sight of a steam roller literally swallowed by the earth. The roller was of the type usually employed in leveling new asphalt streets and for like purposes. It was being trundled through one of the main thoroughfares when it suddenly disappeared, a hole 15 ft. wide, in the paving, marking the place where it had sunk.

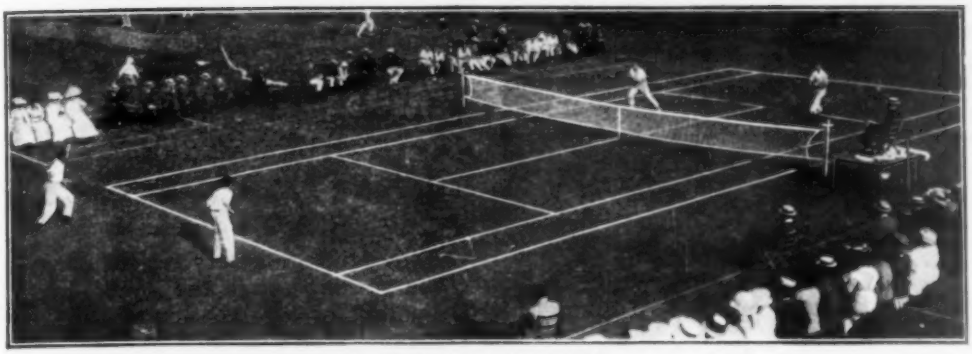
The hole was 25 ft. deep and the accident was caused by a washout under the street due to a leaky sewer pipe which left but a crust of the paving over the deep hole. The roller was the first heavy vehicle to pass the spot after the washout. Quick action on the part of the bystanders resulted in the rescue of the engineer and fireman of the roller who were only slightly bruised.

Two Views of Steam Roller Which Sank Through Detroit Pavement





THESE new pictures convey a more adequate idea of the immensity of this, the world's most ambitious undertaking, than any before taken. They show the mammoth construction work on the Gatun locks of the Panama Canal. Note the water-main openings in the lock wall in the upper view, the black circular spots which resemble port-holes. Consider that these openings, which look like pinheads compared with their surroundings, are 16 ft. in diameter and you get a conception of the magnitude of the concrete work. The completion of the first year of concreting work on the dams shows that 655,083 cu. yd. have been placed.



Note Perfect Line of Top of Net

DEVICE KEEPS TENNIS NETS TAUT

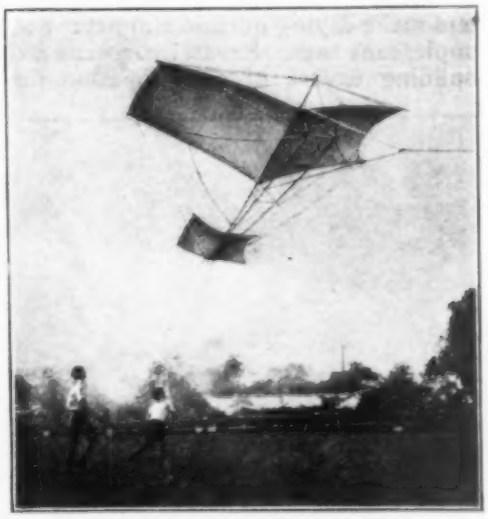
An invention of great interest to tennis players is seen in the accompanying photograph of the finals of the intercollegiate tennis tournament held in Pennsylvania during September. Formerly, the tennis net was tightened by being fastened to the poles at either end, these poles being then placed in their sockets in the ground. But as there was nothing to keep the net taut, it sagged after a short while, owing to the strain on the poles.

A sagging net has always been a cause of trouble to tennis players both in tournaments and private games. The device, just patented, is very simple but keeps the net perfectly taut until released. The net is stretched simply by turning one of the iron poles to which it is attached. When the cord has been turned as far as it will go and the top of the net is held perfectly straight, the pole is locked in place by inserting it in a ground socket provided with teeth that meet corresponding recesses in the bottom of the pole. When these teeth engage, the net cannot sag until the pole is pulled from its socket.

¶Peary's arctic ship "Roosevelt" has been purchased by John Arbuckle, who may add it to his wrecking fleet. Arbuckle is one of the coffee magnates and is also interested in salvage operations.

KITE THAT IS BUILT LIKE THE "DEMOISELLE"

A kite, closely resembling a Santos-Dumont Demoiselle monoplane attracted considerable attention at the aviation meet at Asbury Park, N. J. The kite was built by Thomas C. Brown of Asbury Park, using the measurements of the "Demoiselle" as a guide, and developed a lifting power of 100 lb. The framework was made of bamboo rods covered with unbleached muslin. The forward planes measured 6 ft. by 10 ft. each and the rear or stabilizing plane, 2½ ft. by 6 ft., which gave the machine a lifting surface of 135 sq. ft. The kite was flown with a light braided sash cord.



Kite Patterned after Santos-Dumont Monoplane

CLOTHES DRYING APPARATUS

Clothes dryers may become as common in modern homes as laundry tubs,

One Type of Clothes Dryer

and with as good reason, especially in climates where the long and cold winters make drying outside a difficult and unpleasant task. Several concerns are building dryers of sizes suitable for private residences as well as for hotels or clubs. In some of them the waste heat from the laundry stove is used to dry the clothes, while in others steam heat or gas is utilized.

MILLION-BARREL RESERVOIR FOR OIL FIELDS

Two concrete reservoirs for oil, said to be the largest in the world, are in the course of construction at San Luis Obispo, California, each of which will have a capacity of 1,000,000 bbl. of oil. The reservoirs are to cost half a million dollars, and the oil to fill them will be piped from the Bakersfield, Maricopa, Coalinga and Midway wells. When the tanks are filled, the oil in them will flow, by gravity, to the pumping station at San Luis Obispo, and from thence will be pumped directly to the tank steamers at Port Harford.

The reservoirs are being constructed on a rush order and an army of men is employed in the work. There were 300 teamsters, each driving two-horse teams used in excavating 160,000 cu. yd. of earth in addition to the 300 other laborers employed in other parts of the work. A million and a half feet of lumber will be used for the construction of the roof and supports of

Panorama of Million-Barrel Oil

the reservoirs, and the walls require 18,000 bbl. of cement which will be made into 12,000 cu. yd. of concrete.

GASOLINE-ELECTRIC AUTO FOR DESERT WORK

The problem of heavy haulage through the arid regions of the American southwest has resulted in a very interesting type of combination gasoline and electric auto-truck. Some 80 miles south of Marathon, Texas, and about five miles beyond the Rio Grande in Mexico, is a mining company, whose products of zinc and lead have to be transported to the railroad at Marathon.

The first step was the building of an aerial tramway, 6½ miles long extending from the mines, over the Rio Grande, to the Texas side. This was built at a cost of $110,000. Then the company had to determine the means of getting the ore through to Marathon. The difficulties to be met with consisted, chiefly, of the long distance, the absolute absence of fuel of any sort along the route, and the lack of water, there being none for one stretch of 40 miles.

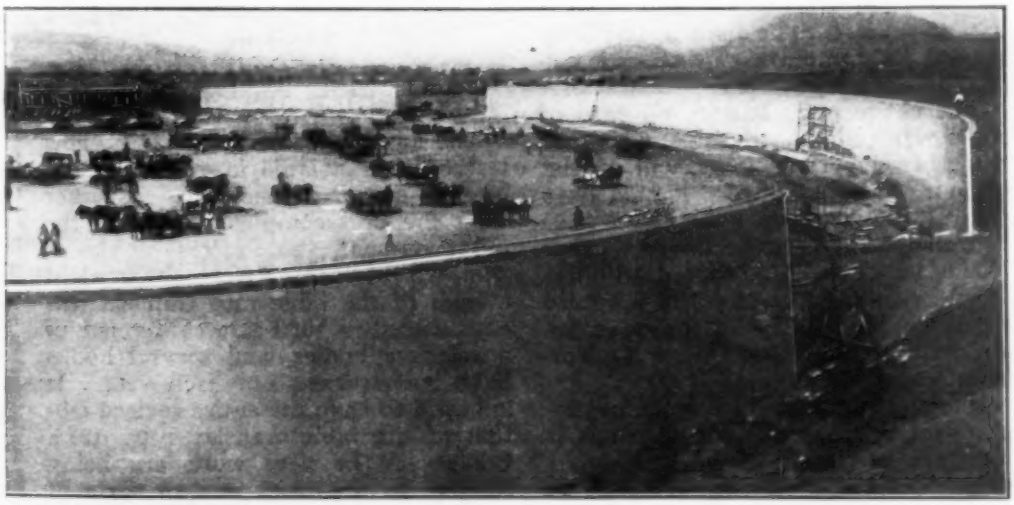
The traction expert called in by the company decided that neither a gasoline nor an electric truck would be satisfactory, but that a combination of the two that would eliminate the batteries of the electric truck and the gears and clutches of the gasoline type, would prove satisfactory.

Consequently, a truck was built that is said to be successful in operation. It has as a power plant a 4-cylinder, 6 by 6½-in. gasoline engine, direct connected to a generator. The capacity of the truck is 15 tons of ore, with which load it will make a speed of more than 4 miles an hour.

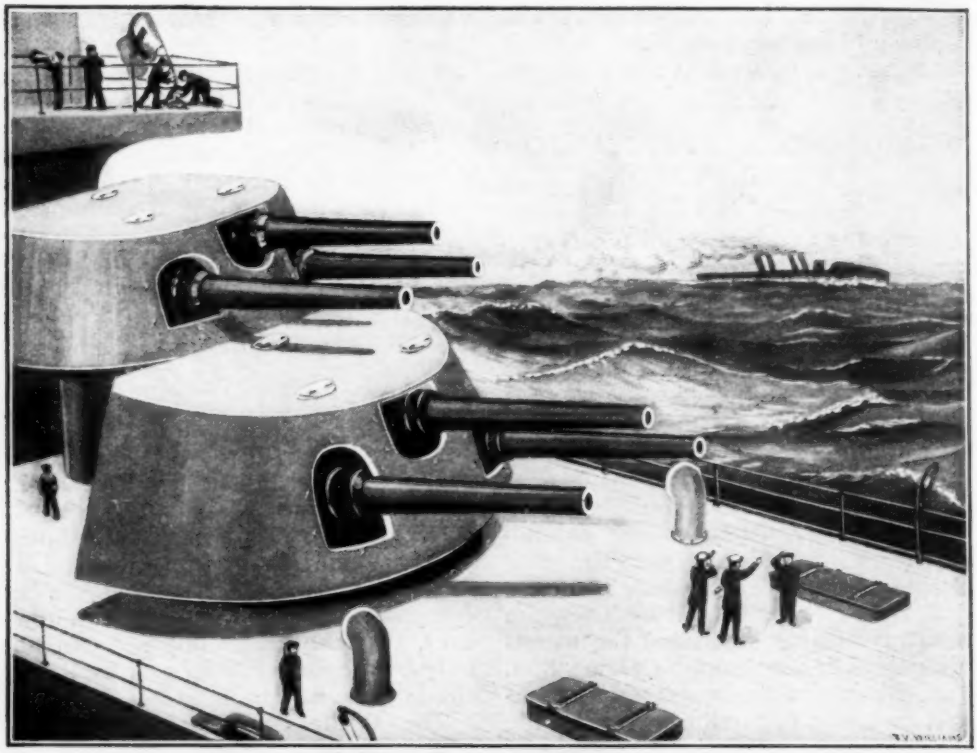
CUNARD MAY BUILD A 1,000-FOOT LINER

It is hinted in England that the Cunard line will construct a liner 1,000 ft. or more long, but the actual dimensions have not yet been given out. One of the officials of a British shipbuilding company has made the statement, however, that the next Cunarder will not only be the largest ship ever built, but the largest ever thought of.

The White Star line's "Olympic," and "Titanic" are 850 ft. long over all, and have a beam of more than 90 ft., so that it is not unreasonable to presume that the ship contemplated by the Cunard line will be at least 1,000 ft. long, and have a beam of more than 100 ft.



Reservoir in Course of Construction



Battleship with Three-Gun Turret

RUSSIA AND ITALY TO MOUNT THREE GUNS IN TURRETS

The practice of placing only two guns in each turret or barbette, which has been universal in all navies for the past 40 years, is to be discarded by Russia and Italy in favor of three-gun turrets, if experiments prove satisfactory.

The entire main battery on each of the new Russian battleships, which includes twelve 12-in. guns, will consist of four three-gun turrets, located on a central line running fore and aft so that all the guns can be fired on either broadside. This, it is believed, will give the Russian ships as powerful a battery as the six-turret ships of the American and British navies, and with a displacement of 3,000 tons less.

The idea as adopted for experimental purposes on the Italian battleships is not quite as radical as the Russian, as only three out of five turrets will be provided with three guns, while the other two turrets will have the present arrangement of two. This will give the Italian ships a main battery of 13 guns.

CHINESE TRANSLATION OF BIBLE FINISHED

The final revised edition of the new testament translated into Chinese has been issued from the press, together with the first completed book of the old testament, the Psalms of David. The work of translating the revised edition of the bible into Chinese was commenced in 1890 at a conference of missionary bodies, and several books have been turned out each year. It is hoped to have the entire revised edition of the bible translated by 1915. Copies of the new work are being shipped to the most remote parts of the Chinese empire.

EVENTS OF THE MONTH IN AERONAUTICS

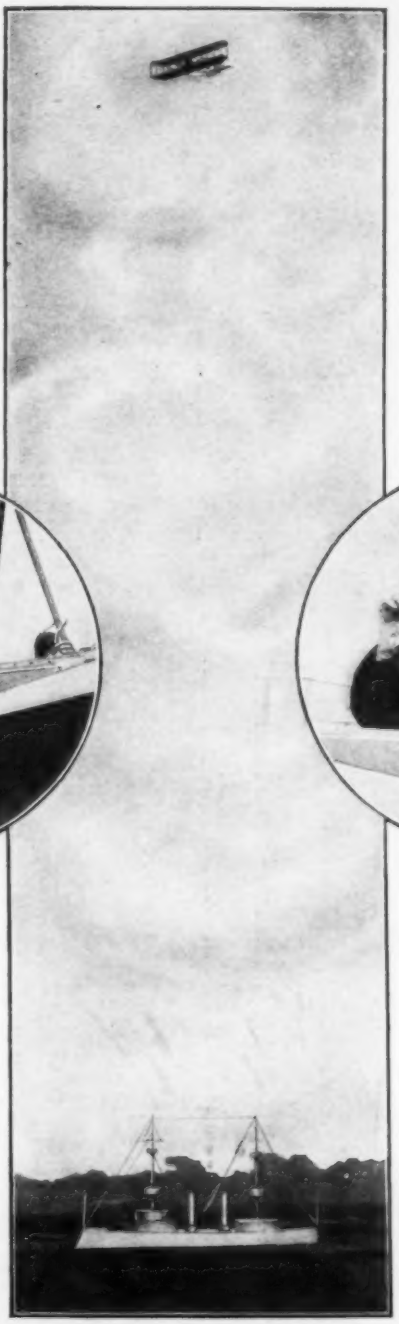
A CENTURY after Napoleon fought the snows and crags of the Alps for two bitter weeks to march his army into Italy, George Chavez, a Peruvian, accomplished the passage in an aeroplane in 40 minutes. The aviator paid for his daring with his life.

Chavez and Henry Weymann, an American, essayed the task of crossing the Alps in aeroplanes, starting from Brieg, Switzerland, with Milan, Italy, as their objective. They were to fly over the mountains pierced by the Simplon tunnel, and the length of their course was estimated at 75 miles. From Brieg to Domodossola, the portion of the trip made by Chavez that included the mountain passes, the distance was estimated at 25½ miles. After several attempts which failed because of contrary winds or fog, they started on the morning of Sept. 23. Weymann was compelled to descend after two trials. Chavez made the perilous journey at the first trial, soaring to a height of more than 8,000 ft. to clear the snow-capped peaks.

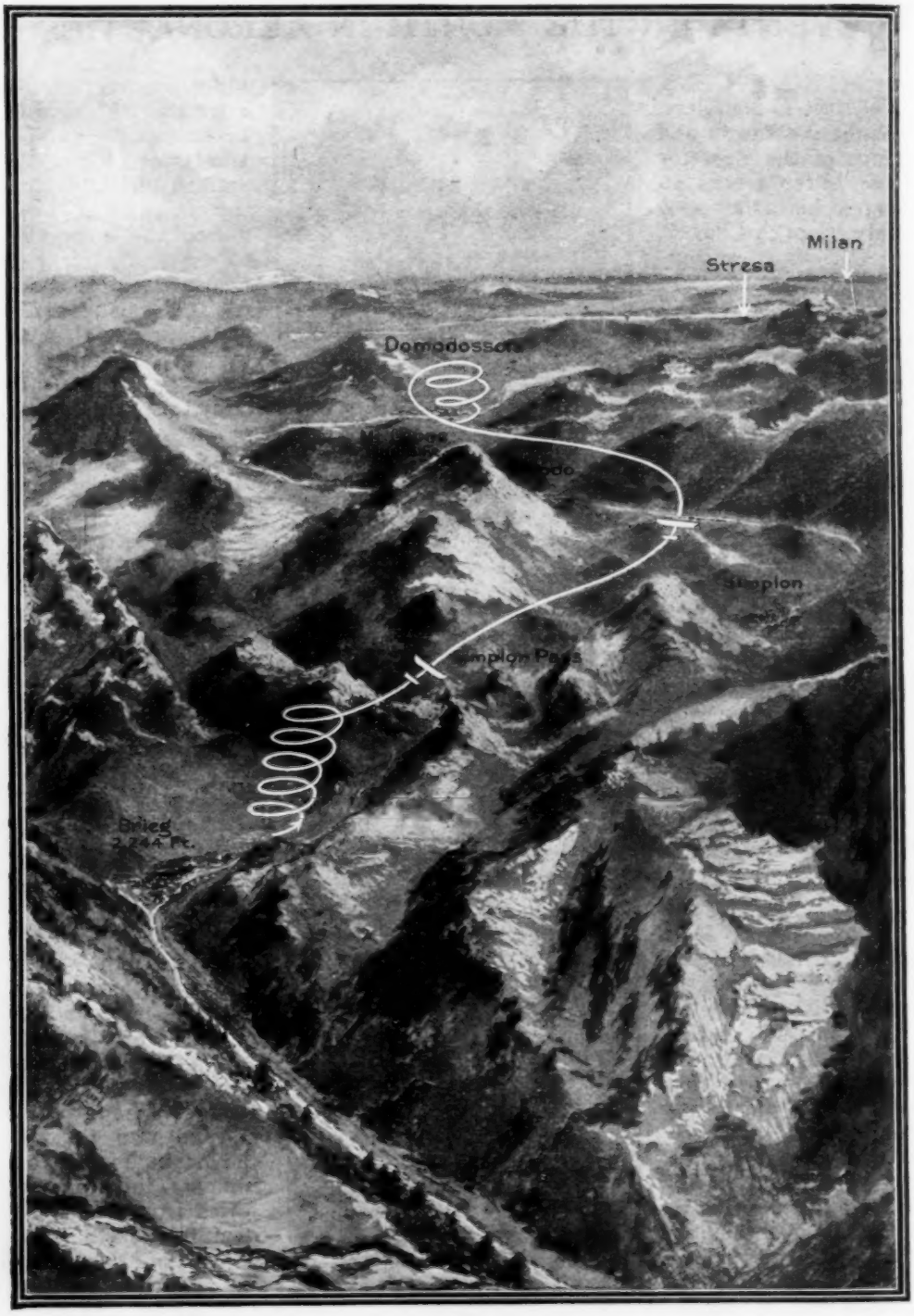
At Domodossola, Italy, when he had completed the most dangerous part of his journey, Chavez attempted to descend. His monoplane capsized when he was 30 ft. from the ground, and he was thrown, the machine falling on him and inflicting injuries from which he died four days later. A prize of $20,000 was the reward offered for the feat. While Chavez did not complete the trip to Milan,

George Chavez, the Peruvian Aviator Who Crossed the Alps

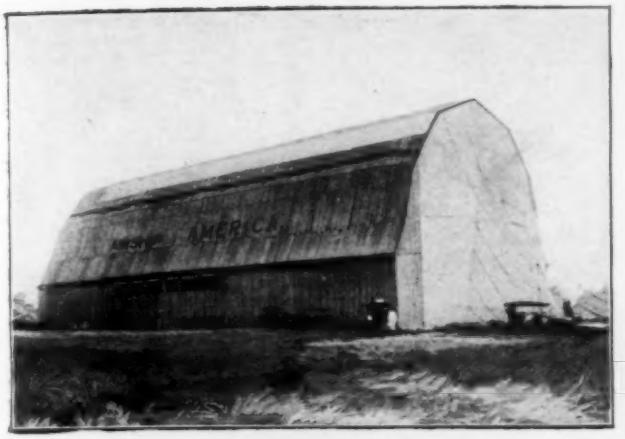
Leon Morane, French Aviator, Who Held Altitude Record of 8,471 Ft.



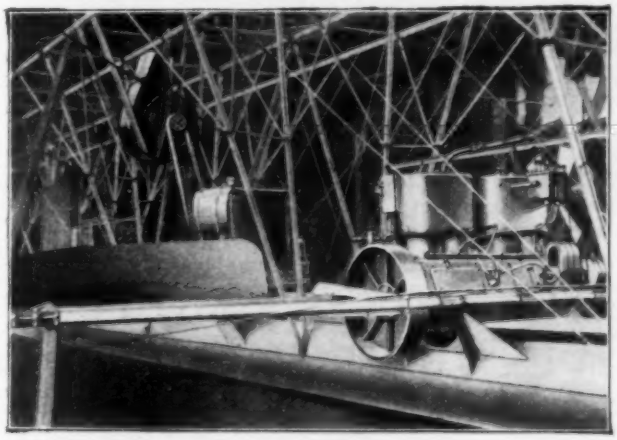
Ralph Johnstone Dropping Imaginary Bombs on a Model Battleship at the Boston-Harvard Meet



Route of the Flight of George Chavez, the Peruvian Aviator Who Lost His Life after Successfully Crossing the Alps



Where the Airship "America" Was Built at Atlantic City



Engine and Propeller Shaft of the Wellman Airship

Propeller of the Airship "America," in which Walter Wellman Plans to Sail Across the Atlantic

the donors of the prize agreed to pay half of it and $10,000 has been paid to his brother.

In addition to crossing the Alps, Chavez set a new altitude record by soaring to a height of 8,792 ft. in one of his trials just before starting on his fatal journey. Leon Morane, the French aviator, had set the mark at 8,471 ft. just a week previous. On Oct. 1, in France, Wymalen went still higher, reaching an altitude of 9,121 ft.

The Boston-Harvard aviation meeting at Squantam Field, Mass., ended with the laurels in the possession of the English aviator, Grahame-White. He was the biggest prize-winner, with Ralph Johnstone second, Walter Brookins third, Glenn Curtiss fourth, and Charles F. Willard fifth, in point of the amount of money won. The better part of the prizes won by Grahame-White were from speed tests, in which he outdistanced all his competitors. The only world's record made during the meet was credited to Ralph Johnstone, who, in a Wright biplane, established a new mark for accuracy in landing by putting his machine within 5 ft. 4 in. of the mark. Johnstone also made a new American record for duration and distance by remaining in the air 185 min. 40 sec., covering a distance of 101 miles, 389 ft. The Roe triplane, which was tested for the first time in the United States at this

meeting, fell after flying 25 ft. and was smashed.

Two airmen besides Chavez lost their lives during the month of September through their devotion to aviation. Edmund Poillot, a Frenchman, fell from a height of 60 ft. at Paris, Sept. 26, and died within 20 minutes. In Germany, Flochmann died Sept. 29 from injuries received in a fall of 150 ft. at Muelhausen, Sept. 28. The King of Italy heads the list of those injured, his majesty having thrown himself to the ground and sustained several slight bruises in avoiding an aeroplane at the Milan meet, Sept. 28. The most curious accident of the month that can be assigned to the aeroplane occurred in Chicago, Sept. 28, when a man, who was watching Brookins maneuver his Wright machine along the lake front, fell through the chimney on which he was standing, a part of which collapsed. It was necessary to tear out a section of brick wall to get him out of the chimney, into the depths of which he had fallen about 60 ft.

Charles K. Hamilton was seriously injured by falling 50 ft. at Sacramento, Cal., Sept. 9. At Milwaukee, Sept. 17, a Wright machine, driven by Hoxey, was swerved into a crowd by a sudden gust of wind and eight persons were hurt. Count Zeppelin's fifth dirigible was destroyed by fire while it was being housed after an unsatisfactory trip of 56 miles, Sept. 14. The carelessness of the crew is blamed for this accident. The engineers were cleaning the bearings, and in some manner a spark fell into an open gasoline tank. An explosion followed, and the flames were communicated to the structure, which was totally destroyed.

In America as in Europe, cross-country flights have called forth the best recent efforts of the aviators. Walter Brookins set a new record for continuous flight, Sept. 29, when he sailed from Chicago to Springfield, a distance of 187 miles, with but two descents for fuel. His actual flying time was 5 hr. 49 min. For two days previous to this flight he astonished and entertained the people of Chicago with spectacular air trips over the city, the first that have ever been made there.

The New York-Chicago flight for a prize of $25,000 has attracted aviators from Europe and America. The event was scheduled to take place Oct. 8, and for a week before that trial flights were had in connection with an aviation meet at Hawthorne, a Chicago race course. Among those who entered for the race, a list including Grahame-White, Curtiss, Willard, Brookins and others, was John B. Moissant, who succeeded in reaching London, Sept. 6, on his flight from Paris with a passenger.

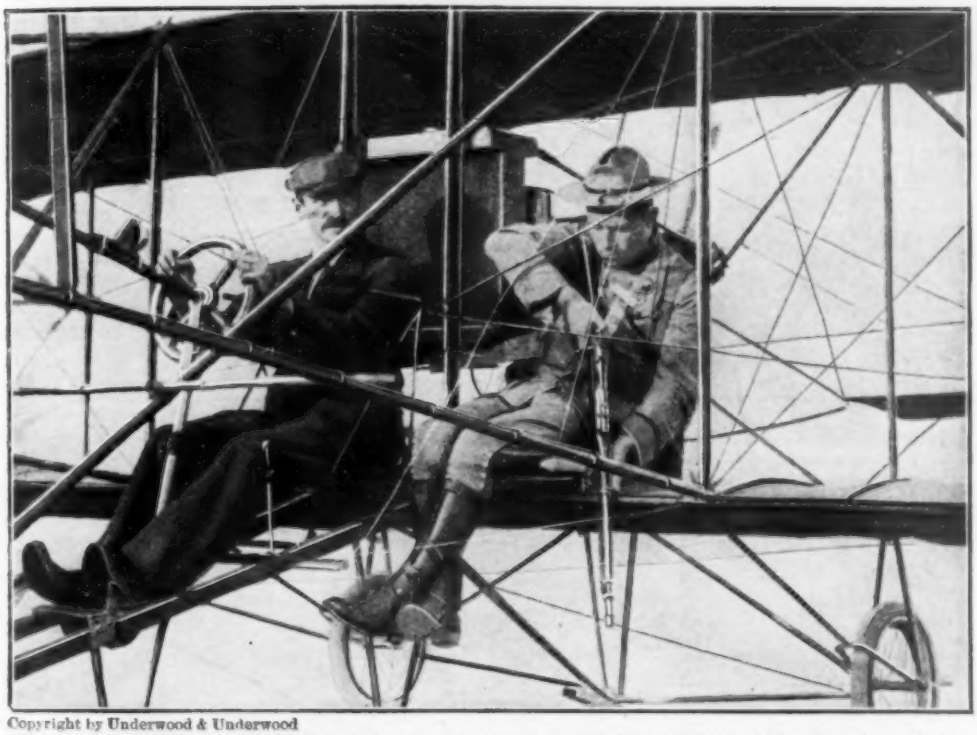
Robert Loraine, the actor-aviator, fell into the Irish Channel 60 yd. from the coast of Ireland, Sept. 11, in his attempt to soar from Holyhead to Dublin. His flight is recorded as a success.

A prize of $10,000 has been offered the aviator who will be the first to fly from Rochester, N. Y., to Detroit, Mich., and the London Daily Mail has offered a prize of $50,000 to the aviator who makes the best time in a 1,000-mile race over England and Scotland next July.

Decided advances have been recorded in the military development of the aeroplane. In France two machines were used at maneuvers with great success. Both were monoplanes, and one of them established a new speed record, carrying a passenger, of 56 miles per hour. Information regarding the movements of an enemy's force, that would have required a day of hard scouting for men mounted on cavalry chargers, was obtained in an hour. In Germany the military authorities had poor success with their dirigibles, the two used being responsible for several tactical errors on the part of the troops in the field.

France is reported to be contemplating the use of aeroplanes in an express service in Africa, a corps of aviators having been assigned to work across the desert and establish sites for repair stations.

Women entered the field of the avia-



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Lieut. Jacob E. Fickel, 29th U. S. Infantry, Demonstrating the Practicability of the Aeroplane as an Aid to Sharpshooters, in a Flight with Glenn Curtiss at Governor's Island

The Venerable Author of "Darius Green and His Flying-Machine," J. T. Trowbridge of Boston, Being Introduced to Grahame-White, the English Aviator

Ralph Johnstone, American Aviator, Who Made Record for Accurate Landing

tor in the United States for the first time. Society leaders, actresses and the wives of well known aviators made short flights, as passengers, during the month of September and one woman steered her own machine in a short flight.

The balloons "New York," "Buckeye" and "Miss Sophia" qualified as American contestants in the international balloon race, scheduled Oct. 17 from St. Louis. Nine balloons started in the qualifying contest.

The transatlantic flight of Walter Wellman in the dirigible "America" has been planned in the most practical

manner. Mr. Wellman has arranged to start from Atlantic City, and the navigation of his ship has been placed under the charge of F. Murray Simons, a merchant-marine officer who secured special leave of absence from the Atlantic line by which he is employed in order to make the trip.

MACHINES FOR PICKING CRANBERRIES

The cranberry industry is a very important, but comparatively little known, American activity in which mechanical devices have lately brought about a revolution. Ingenious machines have been introduced for harvesting the crimson berries and for sorting or separating the fruit, with the result that hand labor has been to a great extent eliminated. By way of illustrating the transformation that has been worked, it may be cited that the "Cranberry King," who formerly employed more than 1,100 pickers on his great "bogs" on Cape Cod, now handles his crop,—thanks to the aid of the machines,—with less than one hundred men.

The invention of these machines, which simplify the operations of the cranberry growers, is also resulting in a great expansion of the territory planted in cranberries. America is the only country in the world where cranberries are cultivated, and the activity is restricted largely to the states of Massachusetts, New Jersey and Wisconsin; but that a goodly supply of the delicacy is required to satisfy the American appetite may be surmised from the fact that the Cape Cod district alone produced last year more than one-third million barrels of cranberries. Bearing cranberry bogs sell for from $600 to $1,200 per acre, but successful growers net all the way from 10 to 100 per cent on their investment every year.

The most interesting of the new machines are designed for picking the berries. These grow close to the ground on vines that are always so tangled as to resemble a miniature jungle and to hide the berries from view except on close inspection. One style of picking machine resembles a small wooden box, of convenient size to be held in one hand and with jaws which open and close by the pressure of the hand. In operation, the jaws are opened and the machine thrust into the tangle of cranberry plants. Then the jaws, each armed with a row of teeth, are made to close and, when the machine is withdrawn, the berries are instantaneously stripped from the stems, remaining in the receptacle until the jaws of the machine are again opened and the berries emptied into the waiting bucket or tray.

The other mechanical picker, which is even more extensively used, consists of a large scoop-like receptacle, the lower side of which is made up of a series of iron prongs set fairly close together. This scoop is shoved into the tangle of cranberry vines, and when it is drawn back, it is found that the vines have slipped between the close-set prongs but have left the berries reposing in the scoop. The operations of these two types of picking machines are ably supplemented by the "separator,"—a hand-operated mill which screens the berries as they come from the bogs and removes all leaves, twigs and other foreign matter.

¶The muzzle of one of the 12-in. turret guns of the battleship "Georgia" was blown off at target practice, Sept. 22, but no one was injured and no other damage done.

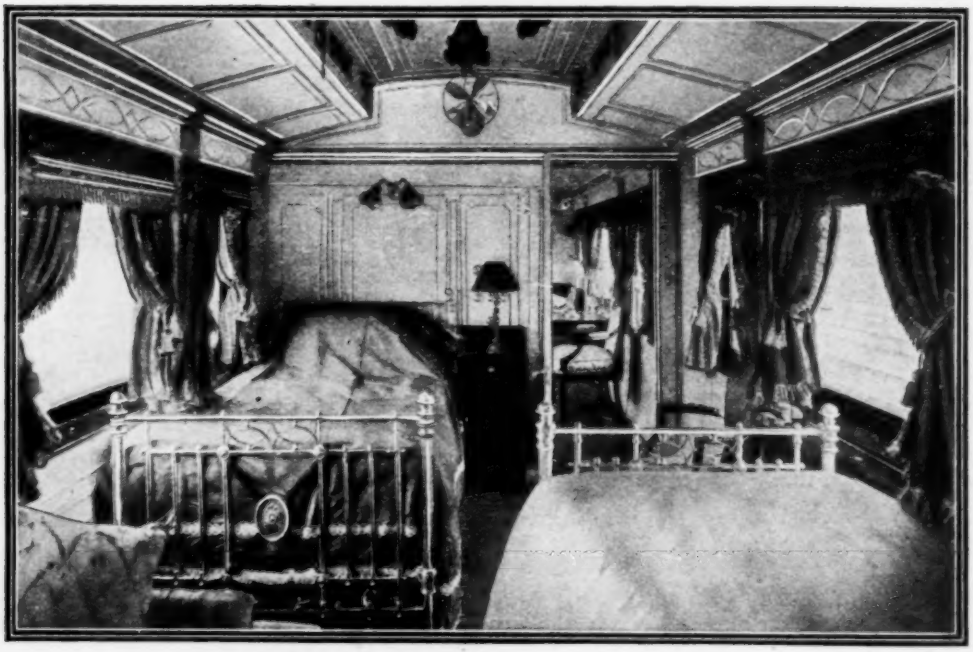
¶The rubber harvest for 1910 amounted to 39,363 tons, according to figures prepared by a German expert, an increase of 1,115 tons over the crop of the 1908-09 season.

Emptying Cranberries from "Picking" Machine

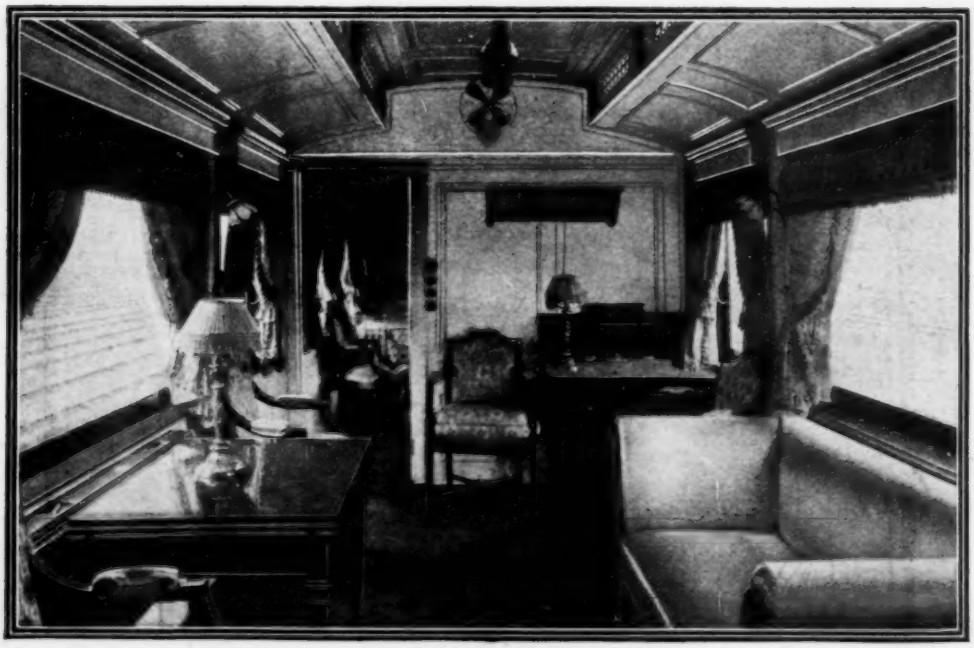
Cranberry Picker with "Clipping" Machine

"Separator" for Handling Berries as They Come from the Bogs

One Hundred Men with These Machines Displaced 1,100 Who Picked by Hand



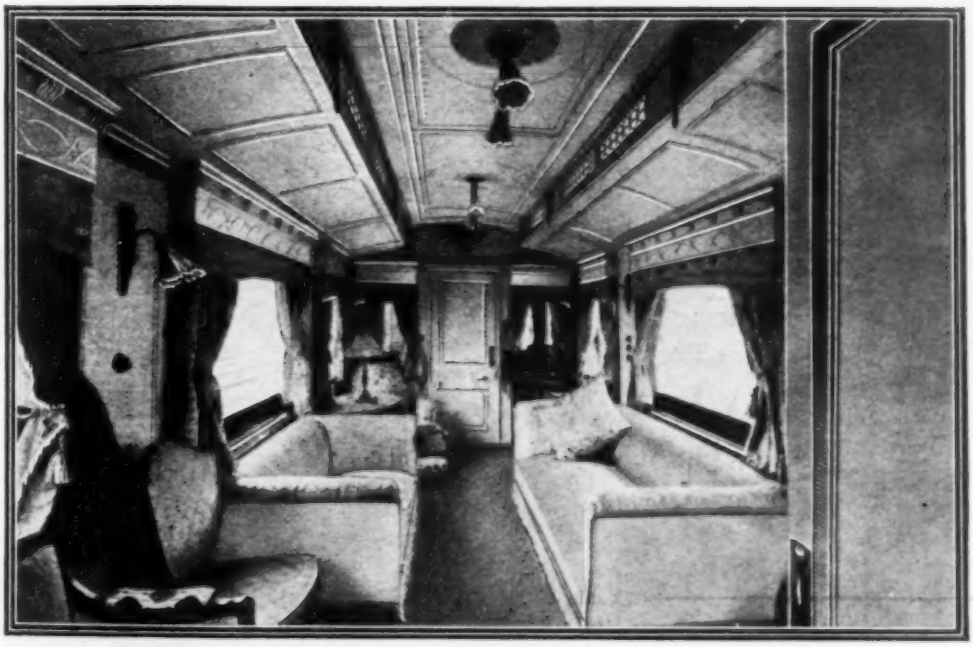
The King's Bedroom—Prince of Wales' Bed in Foreground



The King's Sitting Room

VIEWS OF INTERIOR OF THE NEW ROYAL

The Bedroom of Queen Mary



The Queen's Sitting Room

TRAIN FOR ENGLAND'S KING AND QUEEN

The Sinking of the "Pere Marquette No. 18"—"No. 17" Coming to the Rescue

WHY DID THE "PERE MARQUETTE" SINK?

By J. Q. ROBERTS

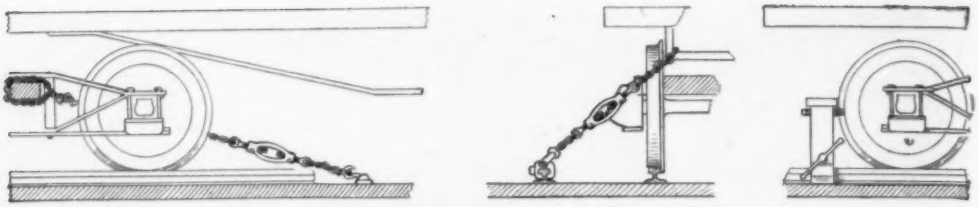
SHORTLY before midnight on Sept. 8, the huge steel car ferry "Pere Marquette No. 18" left her slip at Ludington, Mich., with a cargo of 29 loaded freight cars, bound for Milwaukee, Wis. She was built but a few years ago and had been inspected that very day by two members of the government steamboat inspection service and declared to be as sound and seaworthy as any craft on the great lakes. She was equipped with every safety device, and yet she foundered in the middle of Lake Michigan a few minutes after seven o'clock the following morning.

Twenty-seven members of the crew were drowned, including the captain and the other officers. Thirty-two persons were saved, yet not one of them knew why this staunch vessel sank, and it is doubtful if even the officers knew definitely the cause of the tragedy. Great ships have gone to sea and never returned, and their fate has remained a mystery. Storms and fire have obliterated many of them, yet there are few cases in marine history in which the survivors have not been able to account for the disaster. But in this case, even after an extended investigation in the course of which every survivor was questioned, the steamboat inspection service reported that it was unable to determine the cause.

An idea of the thorough seaworthiness of the ship is afforded by the fact that the officers, even after it was known that her lower and after compartments were filled with water, refused to leave her, but had confidence in her ability to remain afloat. The government report on the disaster censures Captain Peter Kilty for not deserting her, but men who have navigated the Great Lakes for many years, and have been masters of vessels of the same class, declare that he was justified in his confidence.

It is known that at three o'clock on the morning of the ninth, an oiler, going back to oil the bearings of the main shaft, found the compartment under the flicker full of water. He reported this to the engineer who, in turn, reported to the officer on watch that there was something wrong aft, that the pumps were on and the water was gaining on them. The first officer went aft to investigate and returned to the pilot house, remarking to the wheelman that "only a deadlight was busted, and it didn't amount to much." The captain was then called and he took charge of the ship. Fragmentary statements made by survivors, seem to indicate that within a short time three other deadlights in the flicker were taking in water. These deadlights were 12 in. in diameter, and it is easy to realize how four of them, by this time submerged below the waterline by the weight of the water already in the compartments, would ship a volume of water with which the pumps could not cope. The crew began to push cars into the lake in an effort to lighten the stern. Wireless messages of distress were flashed, but it was not until 6:30 that the steamer "Pere Marquette No. 17" of the same steamship line was sighted. By this time all the passengers were on deck, fully aware of the desperate plight of the ship. Even then, however, the captain felt he could make the Wisconsin shore, toward which he had directed the ship when he realized there was a probability that she would sink.

Suddenly the ship listed heavily to starboard, the stern started to go down, the bow raised, and the big car ferry disappeared beneath the waves. While she was going down several explosions, caused by the compression of the air in the closed car deck, blew off parts of the upper decks, and killed many



DEVICES USED TO SECURE FREIGHT CARS TO DECK OF CAR FERRIES

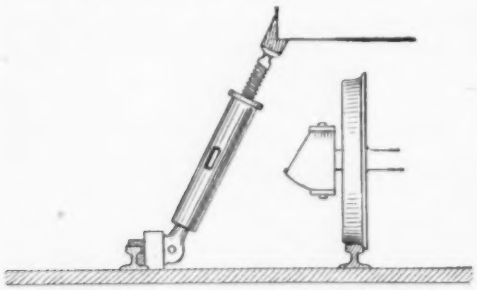
Chain and Turnbuckle Fastened to Floor Hook Between Tracks

Chain and Turnbuckle Fastened to Dog on Extra Track

Iron Jack Fastened to Rail

persons who were struggling in the water. Many of the passengers ran to the bow and jumped into the sea.

The "Pere Marquette No. 18" had been used during the summer as an excursion boat, daily carrying hundreds of the people of Chicago on short lake trips. The trip from Ludington on which she sank was the first of the year as a car ferry. That day the crew had been paid off by the excursion company which had chartered her for the summer, and it has been hinted that some of them had been celebrating.



Brace to Prevent Side Movement of Car Body

The ship was 338 ft. long, had a beam of 56 ft. and a draft of 20 ft. The car deck, provided with four tracks, with a capacity of 30 cars, ran the entire length of the ship, and was open at the stern. While there has been some adverse criticism of this open stern, used by a score of car ferries on the Great Lakes, it has not heretofore been regarded as dangerous. Hereafter, however, these boats will be provided with sea doors, closing up this opening. In December, 1909, the "Marquette and Bessemer No. 2," a car ferry of this type, foundered in a storm on the Great Lakes, and the "Grand Haven," built on the same plans as the "Pere Marquette No. 18," had a narrow escape from foundering during the same winter when, fearing he was too near the shore, the captain attempted to reverse his engines and run his ship backwards. The sea that came through the open

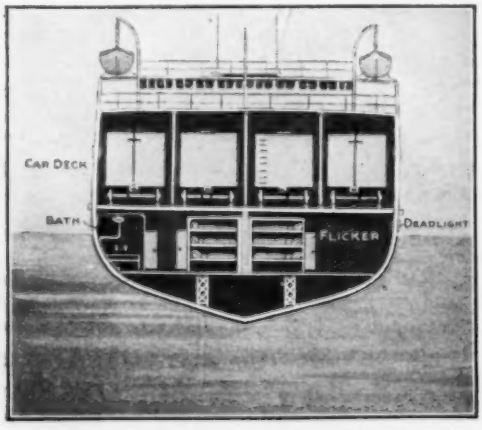
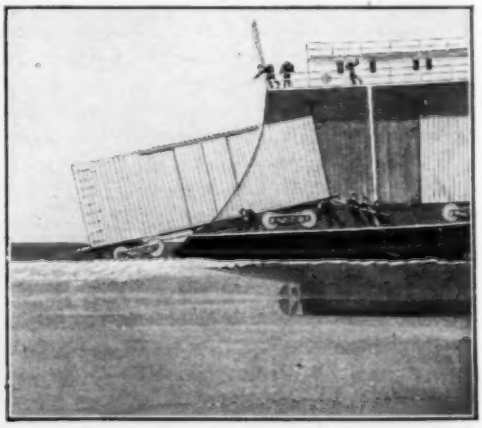
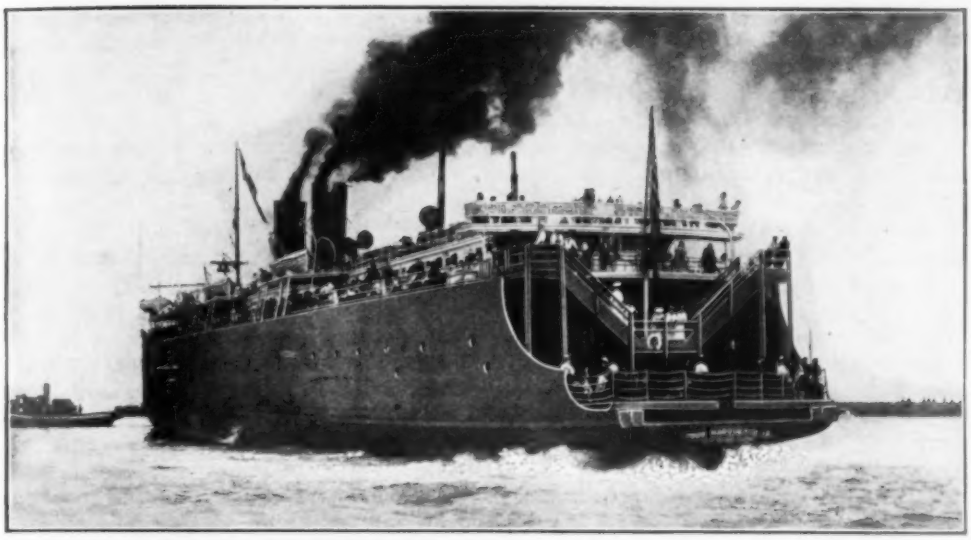


Diagram Showing Arrangement of Cars on Deck, and Flicker Which Crew Occupied



This Drawing Shows How Freight Cars Might Have Caught on "Fantail" at Stern



View of "Pere Marquette No. 18," Taken While She Was Serving as Excursion Boat, Showing Open Stern—Stairways to Lower Deck are Removed in Car-Ferry Service

stern filled the engine room, putting out all the fires with the exception of one, and filled the after compartments with tons of water.

European marine architects have apparently recognized the danger of the open stern, and a car ferry recently built at Newcastle-on-Tyne, for a Swedish railroad company, is provided with sea doors. The officials of the Pere Marquette Railroad, which road operates a large fleet of car ferries, have ordered sea doors placed on the vessel now being built to replace the one which sank.

Every precaution is taken to secure the cars to the deck and avoid what every sailor dreads, shifting of cargo. One of these heavy freight cars could create havoc if it became loose during a storm. There are four principal means of fastening them. Jacks are

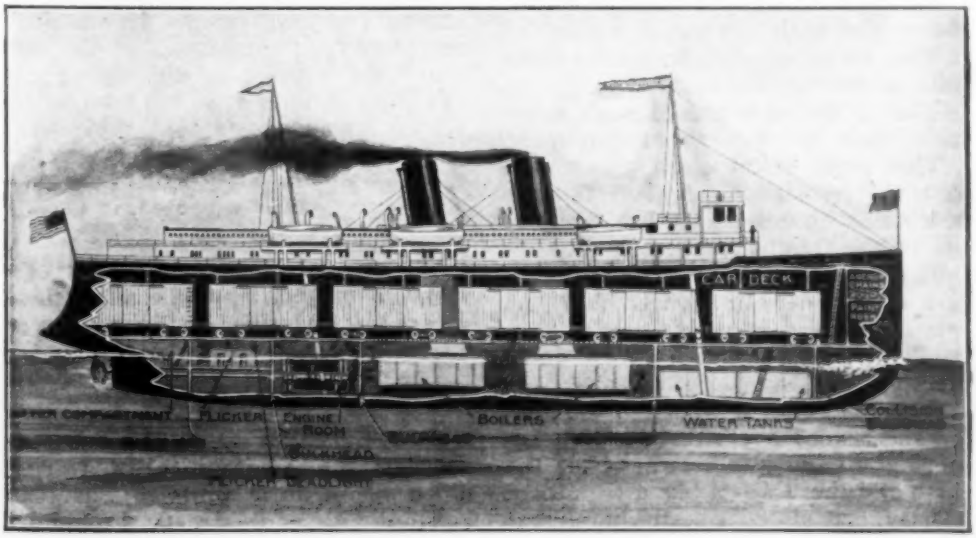


Diagram of Interior Arrangement of Car Deck and Lower Compartments

placed on each side of the wheels, chains and turnbuckles are run from the center of the axles to a floor ring between the tracks, chains and turnbuckles are run from the framework of the trucks to a dog, fastened to an additional rail, placed beside the main rails for that purpose, and a heavy steel brace is placed against the side of the car to prevent its capsizing.

There are as many theories as to the cause of the sinking as there are men engaged in shipping on the Great Lakes. But that open deadlights in the flicker—where the crew slept—were the main cause, seems to be undeniable. These deadlights are only about 20 in. above the waterline, and it was the duty of a watchman to inspect them every half hour.

Following are some of the theories advanced:

That water was shipped through open deadlights in the flicker, filling the lower compartments, and that this condition was not discovered until too late to resort effectively to the pumps.

That the bulkhead between the flicker and the engine room compartment gave way under the pressure of water, permitting the flooding of half the ship.

That one of the 18-in. deck scuttles near the stern might have been washed off by the sea, and the after compartment filled with water.

That water entered through the propeller shaft channels.

That a sea cock was allowed to remain open in the after compartment.

That some of the stern plates were loosened by striking against the slip in which such vessels are backed up to run on the freight cars.

That in an attempt to run freight cars off the deck to lighten the load, some of these cars caught on the "fantail," the added weight pulling down the stern.

When the big car ferry left Ludington she headed southwest for Milwaukee. The wind was blowing from the north and there was a big sea running. It has been stated by survivors that the ship rolled in this sea, and it is very probable that much water was shipped through the deadlights in the flicker with every roll. The crew, as a rule, was quite busy for a few hours after leaving Ludington, and would not be in their bunks in the flicker. In this way, it would be possible to take on enough water to fill the compartment under the flicker and pull the stern down so that the deadlights would be below the waterline. With six deadlights open and the water rushing in under considerable pressure, it would be impossible for the pumps to take care of it as fast as it came in.

Even then, the designers of the ship say the ship could have remained afloat with this compartment full of water. There was water in the engine compartment, so that it is evident that the bulkhead must have given way under the strain. These bulkheads are of ⅜-in. steel.

How the deadlights could have remained open long enough to take in sufficient water to submerge them is one of the mysterious phases of the disaster. A volume of water capable of submerging the deadlights could not be shipped in half an hour. That is the one point which is most inexplicable in view of the fact that one of the strictest rules of these ships is that the deadlights near the waterline be inspected every half hour. It will probably never be explained, for the men who knew went down with the ship in 400 ft. of water. It is but another instance which shows that the human factor can not be eliminated, even when every means of safety and every automatic device ever invented, is used.

¶A train of eight coaches from Chicago on the Pan Handle road attained a speed of 100 miles an hour between Koutz and Logansport, Ind., September 22.

¶The Prince Regent of China is considering the advisability of tearing down the historic walls of Shanghai and building wide streets throughout the old Chinese quarter of the city.

EDITORIAL

SHALL we fortify the Panama canal? seems a silly question, and yet some thin-skinned people profess to believe, at least they express a belief, that this water highway should be a high seas path. . The canal will probably cost about four hundred million dollars, and should be as well worth the price as it is worth the doing. In time of peace, its tolls will doubtless be sufficient to make it at least self-supporting. In time of war, the value to the United States of this short cut cannot be estimated. What would one think of a bank containing millions of gold, whose owners would leave it unguarded through the long watches of the night? What of a huge steamship left at dock with no one on board? The right of the United States to erect and maintain suitable fortifications cannot be seriously questioned by the other powers. Undoubtedly they would all prefer to see it without defenses, for the same reason they would like to see every large power except their own devoid of coast defenses and a navy.

No comparison can be made with the Suez canal, which has no territorial rights, and is owned by an alien corporation. We have the same right and owe ourselves the same obligation to fortify the Panama canal that we have to fortify our home harbors and our island possessions.

* * *

THE cause of the sinking of the Pere Marquette car ferry, while not definitely known to any of the survivors is pretty well determined to be from portholes which were open when they should have been closed. These ports were not so very large, only twelve inches in diameter, and only a few in number, but the man whose business it was to see that they were closed when the lake roughened, for some reason failed to do his duty. It doubtless seemed a commonplace thing to go back to that small after compartment and make sure the openings were shut, but the failure to do so cost the watchman's own life and that of thirty others. It is another sad lesson of the importance of fidelity in what are, or appear to be, small things; and yet most of the serious accidents in modern transportation, seem to trace back to apparently trifling neglect. A switch light is poorly trimmed, as the tender thinks to himself, what matters a single lamp among the hundreds of thousands that nightly connect the farthermost parts of the land with a cobweb of ruby lines. And so the story could be extended indefinitely, but the moral always comes to the fore again, that faithful, conscientious performance of duty is as essential in the unknown, humble worker, as in the leader of men or the hero who saves the battle.

* * *

"WHEN is a life perserver not a life preserver?" is a question which interests us all who travel upon boat lines of river, lake or sea, or have friends that journey by water. The condition of the so-called life preservers on the "Slocum" is even yet fresh in mind, although they were never real preservers in the first instance. However, naval experts declare that any cork preserver, however honestly and carefully made, and however effective when new, deteriorates in time, and according to conditions, sooner or later becomes a heavier-than-water affair. The Shipping World in an editorial urges the adoption of hollow metal life preservers which provide greater buoyancy, size for size, and are not impaired by additional coats of paint from year to year. Investigation has shown that the cork preserver absorbs moisture, in time becoming so deteriorated and sodden as to sink as soon as thrown into the water, while to all appearances it is in perfect condition. The metal life preservers on the contrary remain in condition during the life of the ship.

* * *

THESE lines are necessarily written and printed before the aeroplane flight from Chicago to New York has taken place, but by the time this reaches our readers the event will have become an important chapter in the dazzling records of 1910. The several aviators who are already in Chicago, trimming their sails for the longest flight ever attempted in the history of the world, are brimful of enthusiasm, confident of success and impatient for the day to come. In no previous competition has there been such good grounds for confidence, for the past few months and even days have been piling up success on success. The year has not only brought important mechanical improvement, but continued practice has resulted in an experience and skill which has largely increased the common fund of knowledge. Not for one instant has there been

any thought of hesitation on account of dangers known or unknown. The aviation corps, at home and abroad, have never faltered, and when, at all too frequent intervals, one of the enthusiasts has met with death in awful form, several others with equal spirit have volunteered to take his place.

The confident expectation now is that not only will the Chicago-New York flight be made in less than the allotted time, but that more than one contestant will cover the entire distance. With the experience this contest will furnish, the new year will open with extensive efforts, on a large scale, in all parts of the world, which will fill the coming months with events both thrilling and startling.

As a tribute to the increasing safety of the aeroplane, it is interesting to note that an express train would scarcely suffice to accommodate all the passengers who applied to the contestants for the privilege of being carried on the interstate flight.

* * *

HISTORY has been making so rapidly in aviation as to almost bewilder. In no other mechanical art has there ever been as great progress made in the same length of time. The steam engine, the locomotive, steamship, telegraph, telephone, electric light and automobile, each went through a period of considerable length of time between their point of reasonable perfection and that of practical utility. Aviation, like the aeroplane itself, has leapt into significance with startling suddenness.

Perhaps no other one feature as well emphasizes this as the fact that already men who were prominently in the limelight only a few months ago, as the representative airmen, are already falling out of the line of vision of the public eye. Some devote themselves exclusively to constructional work; others fly only to try new machines of their own design; still others have retired after falls which have either crippled them or taken their nerve. Among these well known names are Bleriot, Paulhan, Farman, the Wright brothers, Duray, Gibbs, Rougier, Sommer, Singer and Rawlinson. It has been said that this retirement is largely due to the intense nerve strain of flying which in a short time so wrecks the strongest nerves as to render a man unfit to go aloft under conditions requiring an absolute control of himself and instantaneous action in emergencies. Perhaps this has been more true in the past than it will be in the near future, as the mechanism of the aeroplane becomes perfected and possibly some automatic device is secured, leaving much less to the decision and skill of the airman.

Mr. Graham-White writing of this feature in the London Daily Mail says:

"It is the tension of fearing that something unexpected may happen—that the engine may fail, that a stay may break, that a controlling wire may snap. Any one of these things may, one knows quite well, bring about a fearful fall. The rush of air, and the fact that one is high above the ground, has very little to do with the ordeal."

And yet another champion of the air, commenting on this, predicts:

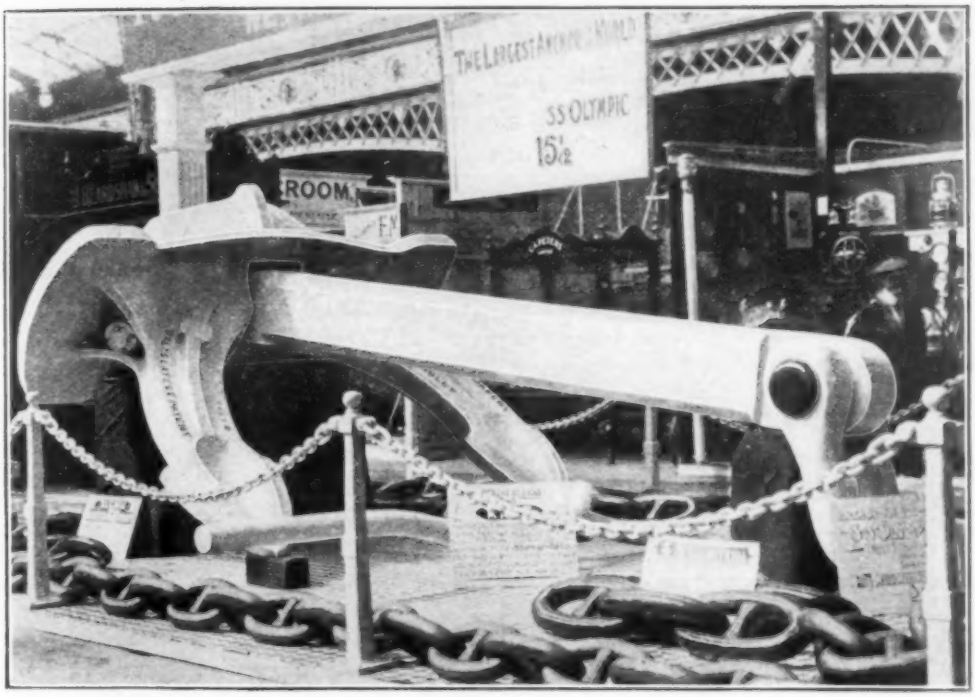
"Experience already proves that flying will become far more easy; aeroplanes are on the eve of enormous development so far as reliability is concerned."

H. H. WINDSOR.

RESULTS OF FRENCH ANTARCTIC EXPEDITION

The achievements of the French Antarctic expedition, under Dr. Charcot, of which illustrations were published in a recent issue, include careful surveys of the previously little known coasts of Graham's Land and Loubet's Land, the discovery that Adelaide Island is 90 miles long instead of only seven, and the finding of new groups of islands. The newly found islands are south of Loubet's Land, and extend into the unsurmountable bank-ice.

Near the island named after Peter the First was found a very deep basin, at one point of which no bottom was reached. The soundings gave depths ranging from 9,090 ft. to 13,050 ft.



One of the "Olympic's" Anchors

LARGEST ANCHOR IN THE WORLD

One of the most interesting exhibits at the recent Engineering and Machinery Exhibition at Olympia, London, was this huge anchor for the "Olympic." It weighs 15½ tons and is the largest in the world, and for the largest ocean liner. The chain for this anchor is said to weigh 100 tons.

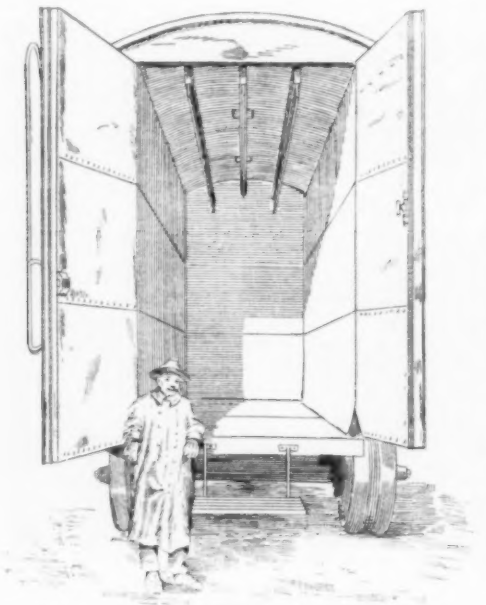
BURNING TUG ABANDONED AND SENT TO SEA

The graveyard of the ocean holds the blackened bones of the tugboat "Lillian Moir," which was sent to sea out of New York harbor under her own steam, her hull and upper works blazing fiercely with a fire her crew tried in vain to quench before they were forced to abandon her. The fire was discovered on the tug at ten o'clock at night as she was putting in at Coney Island Creek for a tow. Unwilling to run the risk of setting fire to the numerous small boats and yachts in the creek and the surrounding harbor, her captain and crew of four men headed the tug out to sea and attempted to put out the fire. Their efforts were vain, however, and so the wheel was lashed to keep her headed out to sea and the tug was abandoned. Searchlights from Fort Wadsworth and Fort Hamilton were kept playing on the vessel as long as she remained within range of the lights. For an hour and a half the people along the Long Island shore were treated to the unique spectacle of a blazing boat of fire steaming out to sea without a soul on board.

¶Reports for May, June, July and August show that 385,083 persons traveled from the United States to Europe during the season of 1910.

REFRIGERATION MOTOR-TRUCKS

The necessity of protecting meat against the influence of heat, even on



View of Interior of Refrigerating Motor-Truck

the relatively short trip between the packing plant and the refrigeration plants on board the ships, has caused a packing firm of the Argentine Republic to install a service of refrigeration motor trucks, which have double walls of metal lined with substantial sheets of compressed cork. Transported in this manner, the meat arrives on board ship in an absolutely sound condition.

REMARKABLE HYDRO-ELECTRIC PLANT IN ARIZONA

A hydro-electric power plant, remarkable for the source of its water supply and the engineering work necessary to utilize it, is located in Hegila County, Arizona. The source of power is water flowing from subterranean springs of unknown depth. The water is so heavily mineralized, that the deposit from it suggested the name Fossil Springs to the discoverer.

The springs yield a flow of 43 cu. ft. per second, which, barring changes by one of the rare rainfalls of the region, has remained absolutely constant from year to year. The flow of water has a possible head of 1,600 ft., but in the present development all of this has not been utilized, as by employing only the lower 1,100 ft. as a fall, it is possible to use a basin of 28 acres as a storage reservoir.

To get the water from the head works to the power house requires 38,000 ft. of conduit, of which 12,000 ft. is of reinforced concrete flume, 10,000 ft. of concrete tunnels, 7,500 ft. of steel gravity syphon, 2,200 ft. of wooden flume on trestles, and the remainder concrete and steel piping.

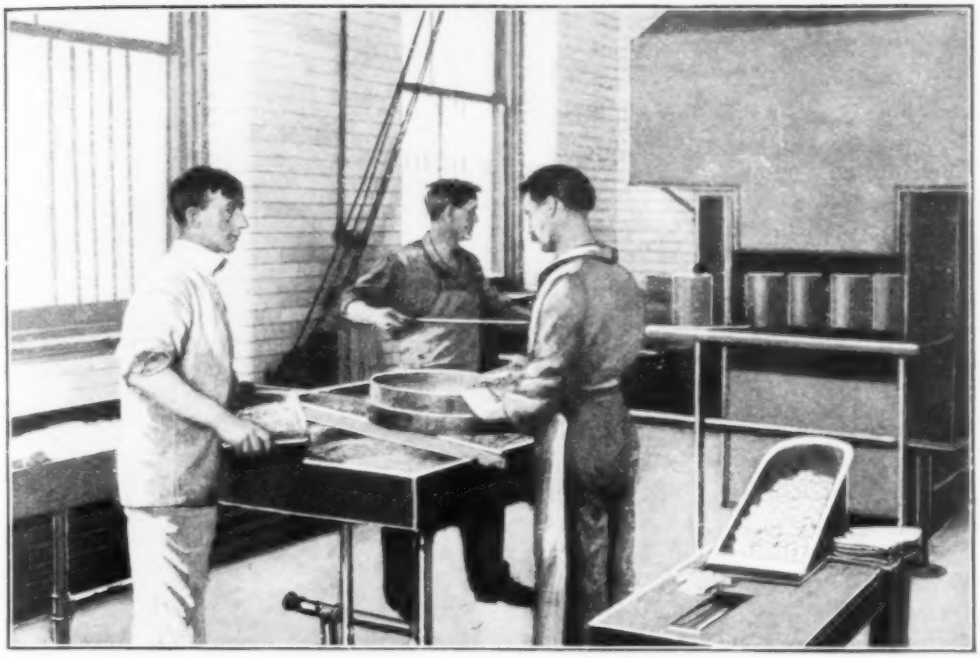
The power house contains three 18,000-kw. generating units with equipment for a line voltage of 45,000, which is carried over 75 miles of steel-tower transmission line. The energy is delivered to Prescott, Arizona, and to the important mining district about 60 miles distant.

TIN MAN AS WALKING ADVERTISEMENT

A hardware dealer in Clintonville, Wis., recently built a giant tin man of materials on sale in his store, hired a man to walk the streets inside of it, and as a result drew much attention to his wares.

A Man of Tin

The giant of tin was 8 ft. 4 in. in height; its head was a 12-in. ball, made of 19 pieces of galvanized iron, with a nutmeg grater for a nose, and tin scoops as ears. The teeth and tongue were plaster of paris, the



"Pickling" Room of the Canadian Mint at Ottawa

eyes of artificial glass, and the hat of Russian iron. A 6-in. tee joint with elbows formed the shoulders, the arms were made of taper joints, and the body was composed of two pieces of galvanized iron, with buttons made of tins taken from teakettle knobs and soldered into rivet heads. The collar was bright tin, the necktie copper, and the vest a piece of galvanized screen covered with cheesecloth. The head of the man inside rested against a thick pad riveted onto the tee joint, and he looked his way through the screen used for the vest. The shirt was a hopper of common stove-pipe iron, the legs were formed of roofing tin shaped as a grain spout, and the foot covering consisted of old shoes covered with aluminum bronze and iron buckles.

"PICKLING" COINS WITH ACID

Few people are aware that all coins that come from a mint must be "pickled." The "pickling" follows an annealing process, which hardens the metal, and removes the copper oxide which the intense heat of the furnaces has caused to form on the surfaces of the blank metal disks. The "pickling" is done with sulphuric acid and the coins are allowed to remain in the bath but a moment. When they are removed, they are dried in sawdust and then passed on to the die machines which stamp the figures on the two sides.

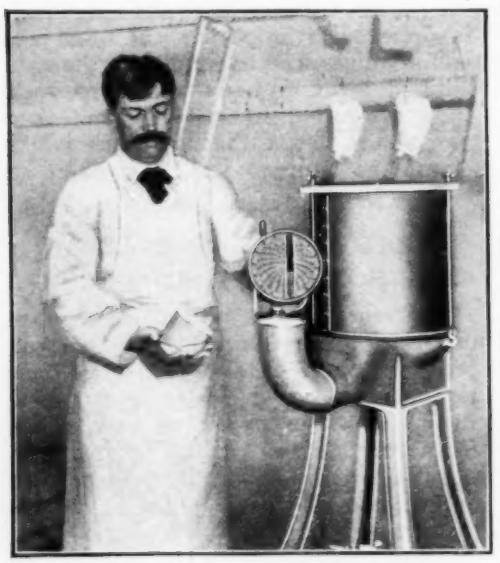
GREAT COALING STATION FOR PUGET SOUND

If Congress makes the necessary appropriations, the Navy Department will construct a 200,000-ton coaling station at the Puget Sound navy yard. Preliminary surveys have been made for a fuel station for the Pacific fleet. A sufficient supply of coal will be kept on hand at all times to meet any demand which might arise during a war.

When the coal mines of Alaska are opened, the supply of coal for naval purposes on the Pacific will come from them. The department has also reserved a site for a coaling station on Resurrection Bay, near Seward, Alaska.

LARD-SELLING MACHINE INSURES ACCURACY

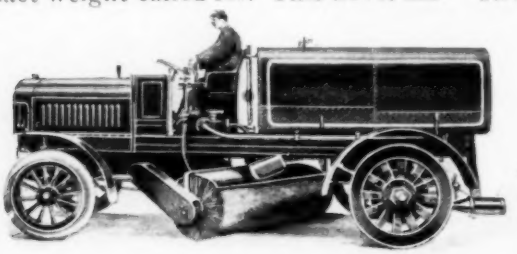
Housewives will welcome the introduction of a device for selling lard which is so constructed that it gives the exact weight called for. This novel machine has just been invented and the weighing mechanism is controlled by the dial to weigh from one ounce to several pounds. A 5-gal. receptacle holds the supply of lard which is forced down into the pipe that is turned upward and has the dial at the upper end. The operator has just swung the upper section of the pipe around to the back to extract the lard measured out therein. The lard surface can be seen in the open pipe.



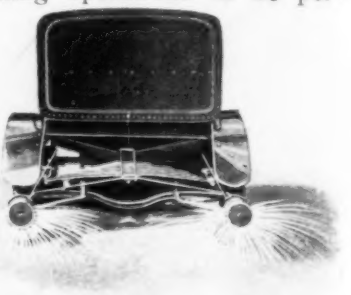
Automatic Scales Gives Customer Exact Amount of Lard Ordered

GERMAN COMBINATION MOTOR SWEEPER AND SPRINKLER

Several German cities are now using a motor-propelled combination sweeper and sprinkler which allows the two street-cleaning operations to be performed either simultaneously or successively.



Side View of Combined Sweeper and Sprinkler



Rear View with Sprinkling Heads

Such a type of street-cleaner is of special value for small communities, as it enables one man, operating this single vehicle, to clean all the streets in the morning, and sprinkle them in the afternoon. On much-used city thoroughfares, the simultaneous sprinkling and sweeping with one vehicle is a great improvement over any method in which two vehicles must be utilized.

The machine develops 25 hp. The gear operating the revolving brush and the centrifugal pump for spraying is mounted on a longitudinal shaft.

EXTRAORDINARY GRADIENTS ON BRAZILIAN RAILWAY

The steepest gradients of any railway built with ordinary rails are found in Brazil on the road joining the bay of Rio de Janeiro with Nova Friburgo, where grades of 92 in 1,000 are encountered. It requires a three-truck locomotive, weighing 40 tons, all the wheels of which are drive-wheels, to draw a train over this bit of track at the rate of 10 miles an hour. During the descent of such grades the brakes are used, and for the steepest places the locomotives are equipped with special brakes that act on an auxiliary rail set between the regular rails.

ELIMINATING THE GLARE IN SPECTACULAR ILLUMINATION

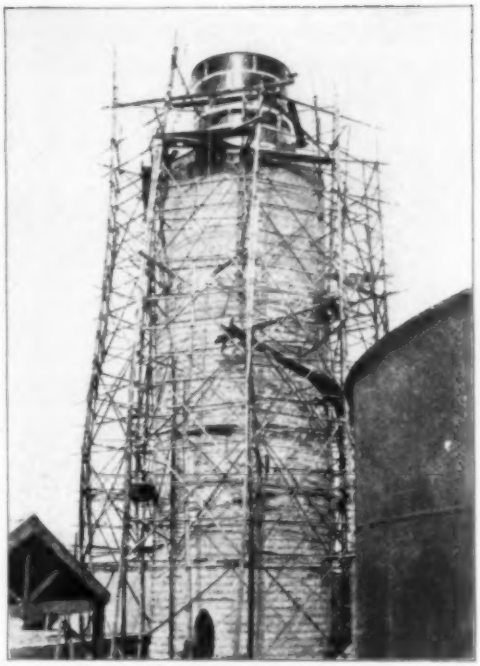
The softening of light used in spectacular exterior illumination is becoming quite general throughout the world, and the use of the glow lamp instead of the incandescent bulb is increasing. Authorities on the subject have come to the conclusion that the new system gives a softer light to the building or device to be illuminated, thereby bringing out the finer lines and artistic features in a better manner than the blinding glare of the incandescent. Only white buildings or signs, or structures of such color as will reflect light well, have been used for this purpose.

One of the best examples of the new system was found at the ill-fated Brussells Exposition where the engineers used 3,500 lamps of varying power to emphasize the graceful architecture of one of the white buildings. The use of lamps of different candlepower to bring out the lights and shadows, if such it may be termed, was highly successful in this instance. Seven hundred 50-candlepower and 800 25-candlepower glow lamps, all concealed, were used for the brighter portions of the scheme, while 2,000 two-candlepower lights were employed for outlining particular features of the architect's plans. The contrast between the relatively dark roof and gables and the brighter walls was striking and received much favorable comment. This method is being employed quite generally throughout the United States for advertising purposes.

CHINESE SCAFFOLDS MADE WITHOUT PLATFORMS

The scaffolding in this illustration is erected around the standpipe at Tientsin, China. There are no nails or bolts used in its construction, the bamboo poles being bound together with ropes. The workmen do their task while standing on the bare poles, no platforms or planks being provided as in America.

The standpipe is rather curious, as it is composed of stone, concrete and steel, each of which materials forms a separate section. The construction is stone masonry about two-thirds the distance to the top. Above this is a concrete section, on top of which rises a steel tank. The structure is 100 ft. high, and has a capacity of 20,000 imperial gallons. The imperial or British gallon contains 56 cu. in. more than the standard gallon in use in America.



Chinese Scaffolding

IRON ORE RESOURCES OF THE WORLD

The report of the International Geological Congress on iron ore gives the total amount of the actual known reserve of the world as 22,408,000,000 tons, of which 12,032,000,000 is in Europe, 9,855,000,000 in America, 260,000,000 in Asia, 136,000,000 in Australia, and 125,000,000 in Africa. Of the 22,408,000,000 tons of iron ore, the proportion of iron is 10,192,000,000 tons, of which 5,154,000,000, or more than half, is available from the 9,855,000,000 tons of iron ore in America.

EXPANSION OF WATER IN FREEZING

The expansion of water in freezing is remarkably demonstrated in this illustration. The neck of the ink bottle is about 1¾ in. long, and the top of the cork is about 3 in. higher on its neck of ice. The bottle burst a few moments after the photograph was taken.

¶A Trinidad sugar planter is said to be making paper from sugar cane stalks with such excellent results that it will pay to grow cane for paper alone, and make sugar as a by-product.

MOTOR TRICYCLES CARRY MAXIM GUNS

Motorcycles of both the two and the three-wheeled type took prominent parts in the recent maneuvres of the British territorial army, which corresponds to the national militia in this country. Among the most interesting machines were two motor tricycles, each fitted with a special platform on which a Maxim gun and its tripod were carried.

In addition to the gun, each machine carries three gunners, of whom one, facing forward, operates the machine, while the two others, facing backward, occupy small seats, one on each side of the platform. The gun is kept in place by a raw-hide thong and one pull of this is sufficient to disengage it from the platform. Thus, when the firing position is reached, the gun can be quickly set up.

POWER STATION USES GAS AND OIL FUEL

Natural gas, with oil as an auxiliary in case of low pressure or accident to the gas supply lines, is the means of generating heat adopted by the electric light and traction company at Fort Smith, Ark. The natural gas has proved itself thoroughly dependable as a working fuel, and the oil supply is called on only at times of heavy commercial gas consumption, when the operation of the plant burners seems likely to affect the distribution pressure.

NEW SELF-COOLING GUN

Tests are being made by a Toledo, O., company, of a new self-cooling gun, built on the machine gun principle, which, it is claimed, is so arranged that the life of its barrel is extended from the limited period of the ordinary uncooled weapon to an indefinite number of years. As many as 500 shots have been fired from the gun without materially raising the temperature of the barrel. The device consists of an outer metal jacket fitted over the barrel of an ordinary service rifle, into which a cooling liquid is pumped from a barrel or tank. The turning of the crank that operates the firing mechanism also works the pump. The gun is mounted on wheels and weighs 300 lb.

For Rapid Transportation of Maxim Guns

THE SOUTH CHICAGO STEEL MILLS AT NIGHT.—The Glare of the Furnaces and Bessemer Converters Turn Night into Day, and Thousands of Men Reverse Nature's Program to Appease the Insatiable Appetite of Progress for Steel.

WHERE MEN MAKE MOUNTAINS OF ORE INTO MILES OF RAIL

By WILLIAM F. WILLARD

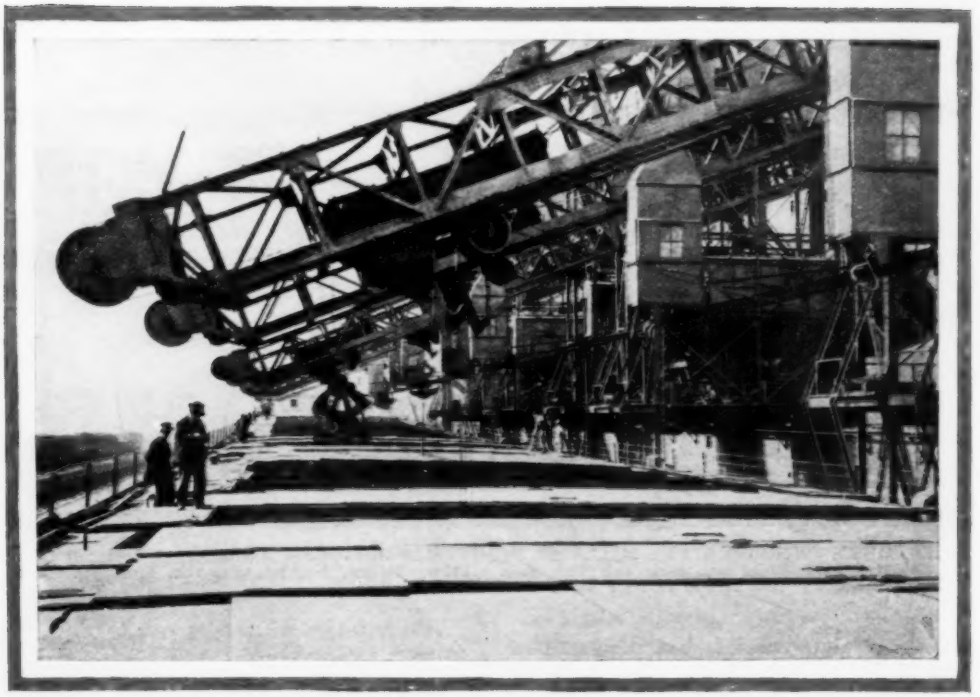
CAPTAIN John Smith, of Jamestown, Va., was somewhat of an ironmaker in his day. True, he had no Carnegie, Gary, Schwab or Frick on his board of directors, but, considering this disadvantage, he did pretty well. When the doughty captain and his sturdy band of Englishmen settled down to live a life of simplicity at the town on the James River which they had named after their sovereign, their supply of plowshares, guns, tools, and other agricultural and domestic implements ran low, and, in true pioneer fashion, they began to consider the possibility of establishing a little iron trust all their very own.

Diligent experiments resulted in the setting up of a very modest iron furnace, and by dint of labor and perseverance, a few pounds of real iron was produced and wrought into useful articles.

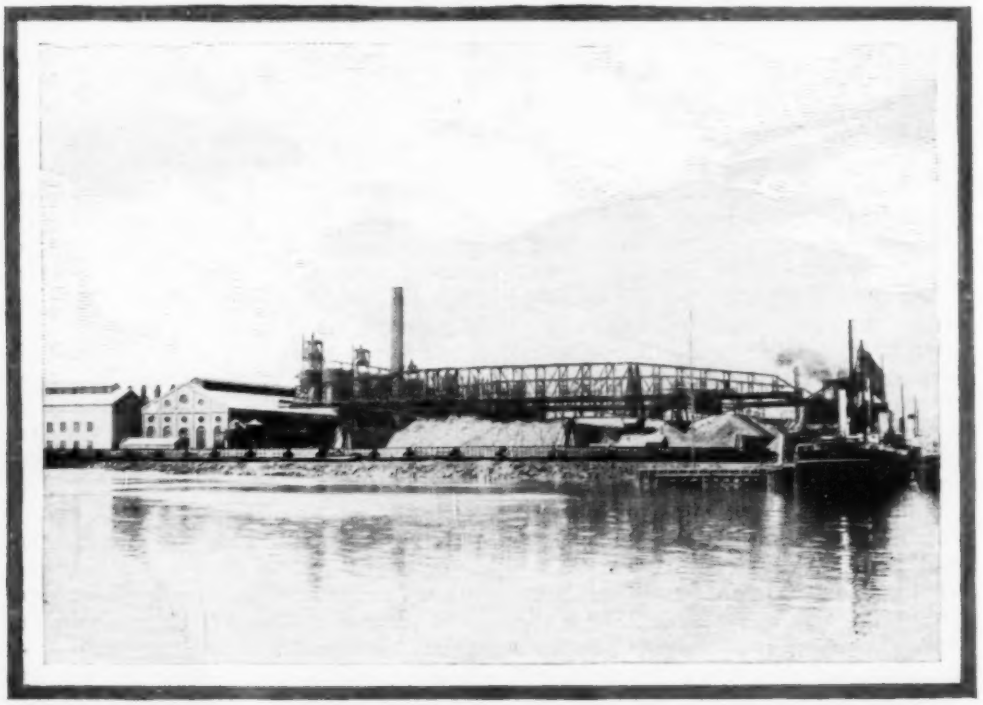
That the Jamestown iron industry did not result in the establishment of many libraries was not the fault of Captain Smith. It was in 1622, three years after the furnace had begun to do business, that the hostile Indians visited the settlement and proceeded to kill, burn and demolish. They did not overlook the iron industry.

It is probably safe to say that if the shades of the Captain and his ironworkers could visit some of our great steel mills today, they would be very much surprised. They would see an ingot of fiery red steel, manipulated by giant hands, made into a steel rail in a few minutes, and they would also see ponderous rollers shape a billet into sheets of metal in an equally short time.

The most impressive thing about our great steel mills is the apparent simplicity of their methods. Yet this has been reached only by years of work and study, and, it must be said, at the cost of hundreds of lives.



ORE UNLOADING MACHINES.—With these unloading machines a boat holding 12,000 tons of ore can be discharged in 4½ hours. Some of the boats have 36 hatches. The "clamshell" buckets, shown on the fourth boom, seize seven tons of ore at a time and carry it 50 ft. to the ore trough, the entire operation being performed in one minute.



DOCK, ORE YARD AND BLAST FURNACES.—This view shows the complete method of handling ore from boat to blast furnaces. A 15-ton glab, traveling on the 525-ft. bridges, distributes ore in the yard, according to its chemical composition. This dock, on Calumet Lake, is 1,700 ft. long, 600 ft. wide, and has a capacity of 1,250,000 tons of ore.

BATTERY OF FURNACES IN OPEN-HEARTH PLANT.—A terrific heat is created in these furnaces by currents of air fired alternately from one chamber to another. The furnaces are tapped and metal allowed to run into immense ladles, such as is seen in the middle of the pit. From this it is poured into moulds.

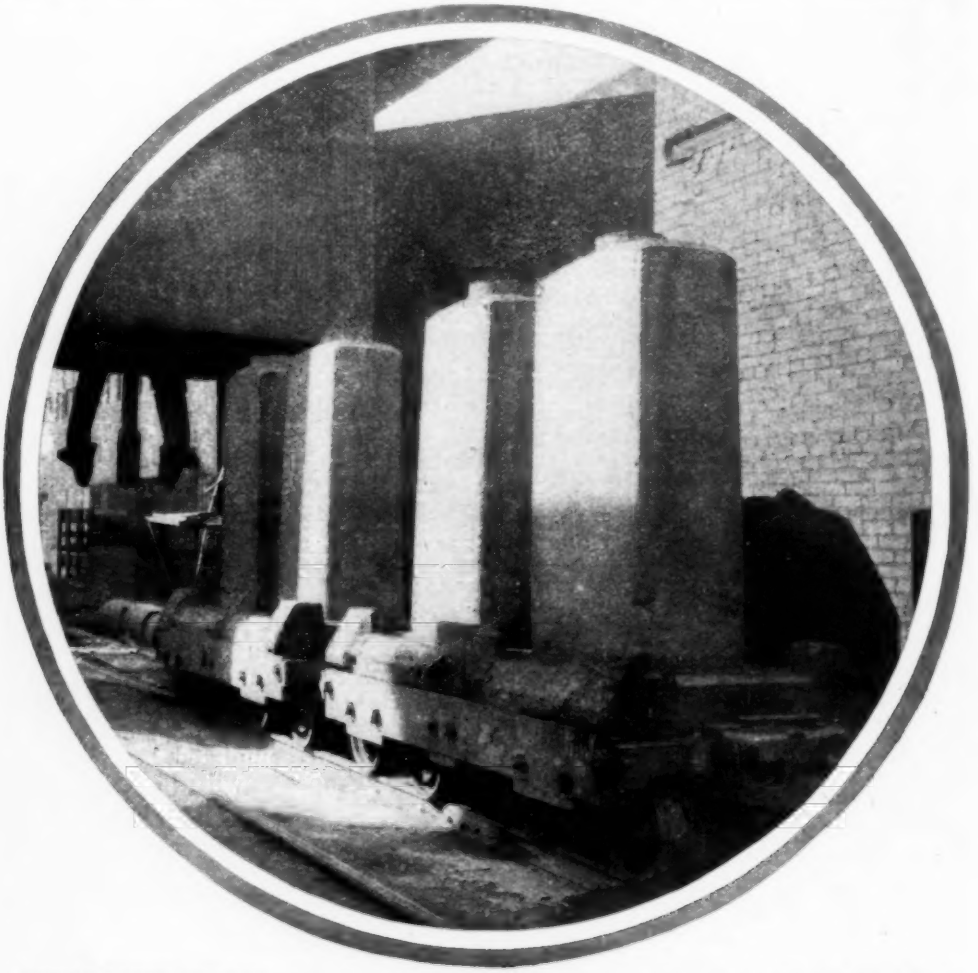
It was not so very many years ago that Pennsylvania was the source of all of our steel. Now, great steel mills are operated in all sections of the country, north, south, east and west. With the great deposits of the Lake Superior region at their doors, the mills of the United States Steel Corporation at South Chicago and Gary are working day and night. At Birmingham, Ala., other mills are transforming the ore of the surrounding mountains into rails and structural steel, while out at Irondale, Washington, a new era in the industries of the Pacific Coast was opened a few months ago when the plant of the Western Steel Corporation began to turn out ingots.

The Gary plant, around which a city was built, is destined, it is said, to be the greatest steel producer in the world, not excepting the Krupp works of Germany, which employ 68,985 people. But the plant of the Illinois Steel Company at South Chicago is keeping pace, and is clinging tenaciously to its reputation as the largest mills in the United States. When the plans for the Gary plant are completed, however, the Illinois company will have to take second place, in the amount of production, at least.

The blast furnaces at the South Chicago plant never sleep unless they become indisposed. They are eleven in number and at night, for miles around, the reflection against the sky resembles sheet lightning. The principal blast furnace is the largest stack, and it is here that the ore is charged and smelted, and from this the molten metal is taken. Here rivers of iron are as common as water.

There are two processes of making steel. Each requires the hot liquid metal from the blast furnaces. In the Bessemer process, the hot metal is conveyed to the mixers, where it is re-

tained until ready to be sent to the converters. Besides the virgin iron, ferromanganese (spiegel) and steel scrap is afterwards added to the hot metal to improve the fiber and quality of steel in carbon, the grade of steel depending upon the amount of carbon it contains. it is more than sufficient to maintain the bath of the iron liquid even after practically the whole of the carbon has been burned and the melting-point greatly raised. The process carried on in the converters is a very beautiful and impressive sight. It reminds one



OPEN-HEARTH INGOTS.—After metal has been sufficiently cooled, the mould is lifted by the "grip" seen on the left. The mould is provided with lugs on the sides, and the hooks of the grip engage these lugs. When the grip is lifted, the plunger, seen in the center of the grip, rams the ingot down.

The metal is now sent to the converters, which are large vessels lined with fire clay. Here a strong blast of air is forced through the molten pig-iron, producing a rapid destruction of the impurities of the metal. The amount of heat resultant from this oxidation or combustion is so great that of the pictures in Dante's "Inferno" of the bottomless pit canopied in pyrotechnic splendor, or the scenes so vividly described in "The Last Days of Pompeii."

The molten metal in the Bessemer converter requires about ten minutes of the blast, whereupon the vessel is ro-

tated into a horizontal position and the metal poured into ladles. These ladles are handled by mammoth hydraulic cranes which work as though endowed with human intelligence. Every operator here must have perfect control of his machine to protect the lives of his fellow workmen. Imagine a huge crane supporting a caldron of hissing, seething tons of molten metal near your head! And then the tap-hole must be opened by hand! Should only a half pint, or even less, of the liquid touch the clothing, or hand, the result would be disastrous to the workman.

When the tap is open the metal runs into pyramidal forms mounted upon trucks. These forms are molds for ingots. When cool enough, a machine called a "stripper" lifts off the mold, and the ingot, 18 by 20 by 56 in., still hot, is sent to the rolling-mill to be rolled into steel rails. Before the rolling process takes place, the ingots are "soaked;" that is, they are reheated to an incandescent heat, and then hoisted by cranes upon the "runs" which carry them back and forth through monstrous blooming-rolls.

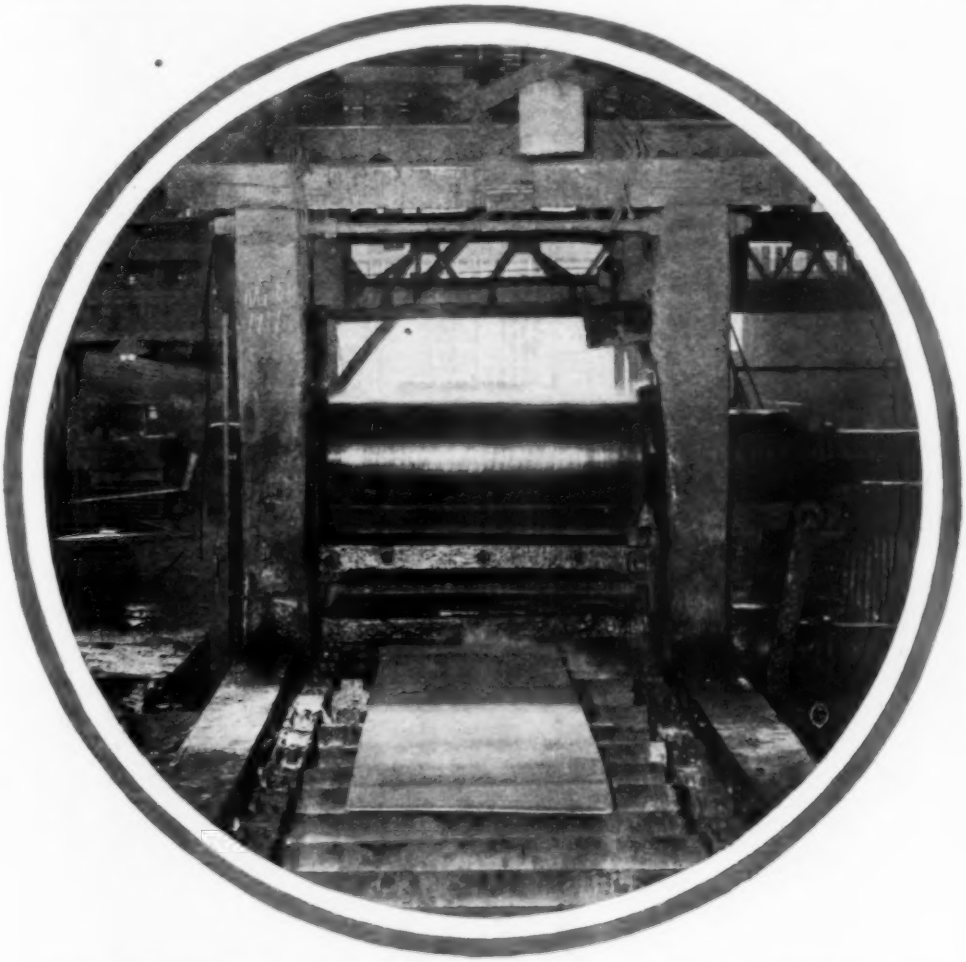
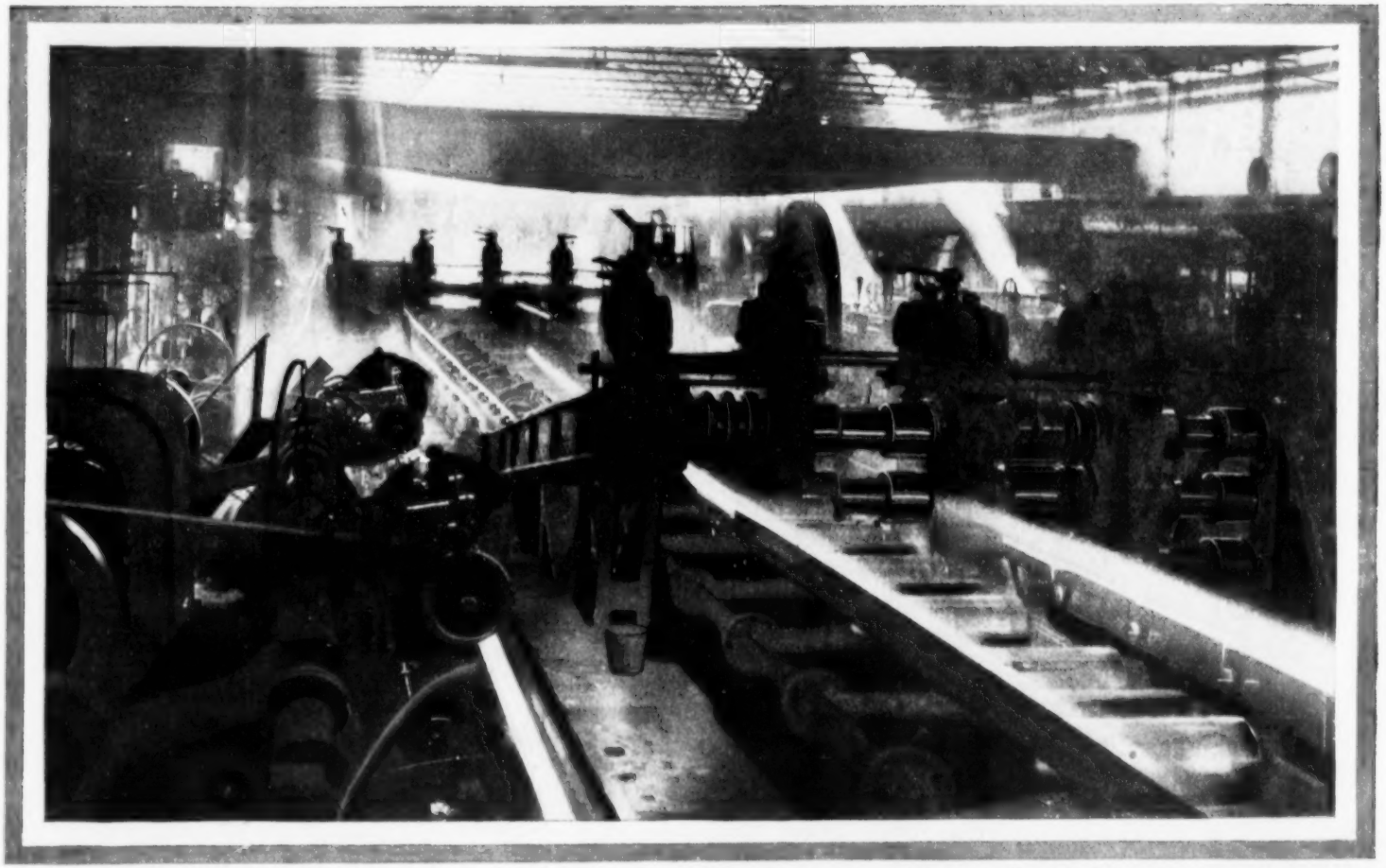
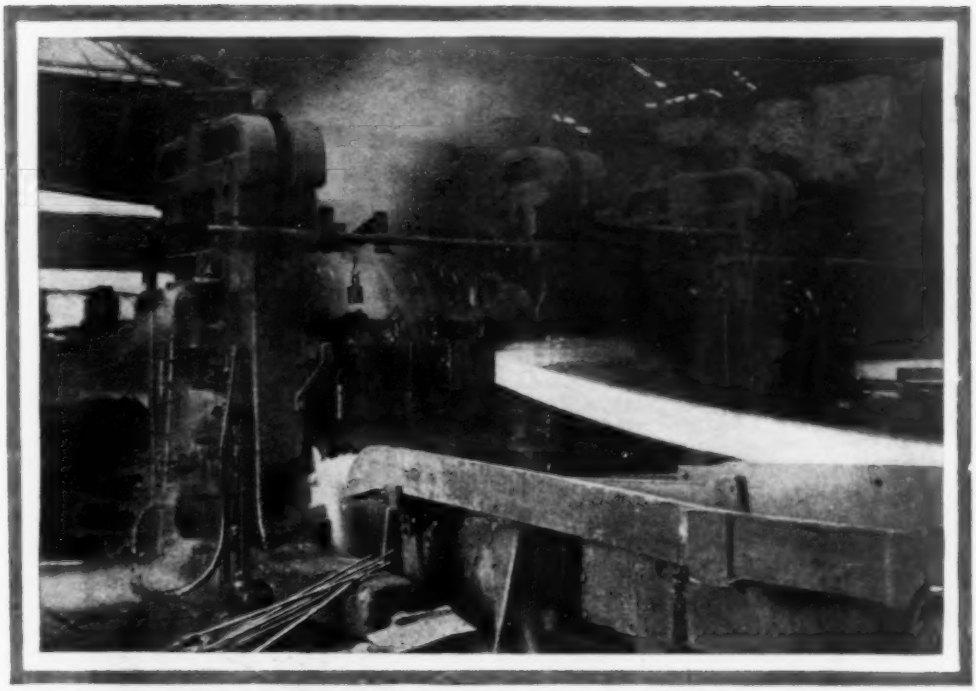


PLATE MILL ROLLS.—A slab of steel, heated to incandescence, is passed back and forth between the rolls until reduced to a plate of the desired thickness in the same manner that pie crust is rolled. There are three rolls and each weighs from eight to ten tons.

The product of each converter is



GENERAL VIEW OF THE RAIL MILL.—Three minutes after an ingot is placed in this mill it has assumed the shape of a rail, and is cut to the proper length by the circular saw seen at the left. It passes through 18 rolls before it is sawed off, each approaching nearer the shape of the rail. The strip of metal is passed automatically from roll to roll, requiring no attention. Leaving the mill, the rail is cooled and straightened, drilled for fish plates, and is ready for shipment.



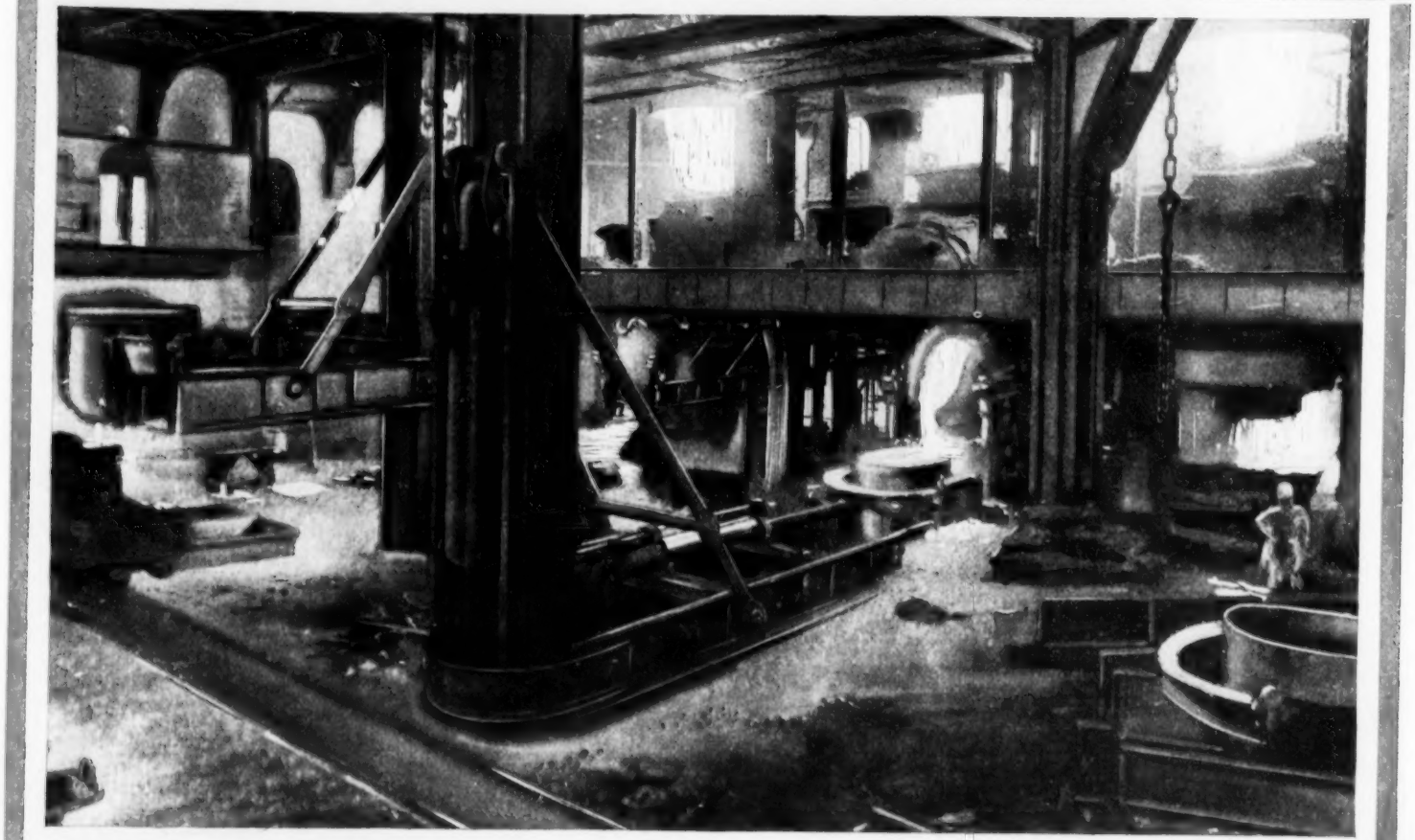
THE FINISHING ROLLS AT THE RAIL MILL.—The ingot is passed through rolls, successively smaller, the openings of which gradually approach the shape of a perfect rail, until, after 18 such "passes," it evolves as a long bar, which is cut into 30-ft. rails.

tested and analyzed by chemists in well equipped laboratories at the plant. Each order specifies the proportion of carbon, sulphur, manganese and silicon required, and the tests must bear out the specifications of the engineers. As a record is kept of these tests, any complication or accident arising even in years after can be traced back to the order and to the chemical analysis made at the time of purchase. The larger railroad companies also employ experts who make tests unbeknown to the manufacturers and not in cooperation with them. In the physical laboratory the metal is tested again for tensile, torsion and compression strength.

The Bessemer process dates from 1856 and was named after its inventor, Sir Henry Bessemer, an Englishman, who was born in 1813 and died in 1898. Of his numerous contributions to science, the manufacture of steel crowned him with fame. While the process has been improved considerably, no material changes have been made in his method, although of late years, considerable prejudice has been manifested against the Bessemer process. Experts favoring the open-hearth process have blamed Bessemer rails for some railroad wrecks, but it is an open question, on which authorities are at variance.

There are two open-hearth furnaces here. In these, also, the melted ore from the blast furnaces becomes the base of the product. Limestone, silicon and ferro-manganese are added as before, but the gases have an easier opportunity to escape from the furnace, and hence the air blast is not necessary. Scrap iron is added to the liquid mixture, and this is done by means of a crane. Every addition to the hot metal is weighed and recorded.

The principle of the open hearth is to develop a heat far above that of any ordinary coal or gas furnace. The hearth of this furnace has a bottom of magnesite about 8 ft. deep. Upon this bottom lies the lake of molten metal.



A COMPREHENSIVE PHOTOGRAPH OF THE BESSEMER PROCESS.—This is said by steel experts to be one of the best photographs of the Bessemer process ever taken. Three converters are seen in the background. A blast of air is forced up through the molten metal for about 12 minutes, to remove impurities. It is then refined steel. The converter is then tilted and discharges its contents into an intermediate ladle, which in turn dumps its contents into the pouring ladle. This secures a more homogeneous composition. The pouring ladle is then picked up and swung around by the huge crane seen at the left of the illustration, and is poured into hollow iron moulds, carried on small trucks.

Magnesite is found to best withstand the terrific heat and the disposition of the metal to burrow. Brick of magnesite are also used about the furnace. After the charge has been placed, currents of air and gas are fired alternately across from one chamber to the other, creating a terrific heat. This burns out all of the impurities, whereupon ferromanganese, an imported product from Austria, is added as described above. Manganese supplies the necessary percentage of carbon. Limestone helps to remove the phosphorus by forming a slag which is capable of absorbing phosphorus. It also assists in preventing the destruction of the lining of the furnace.

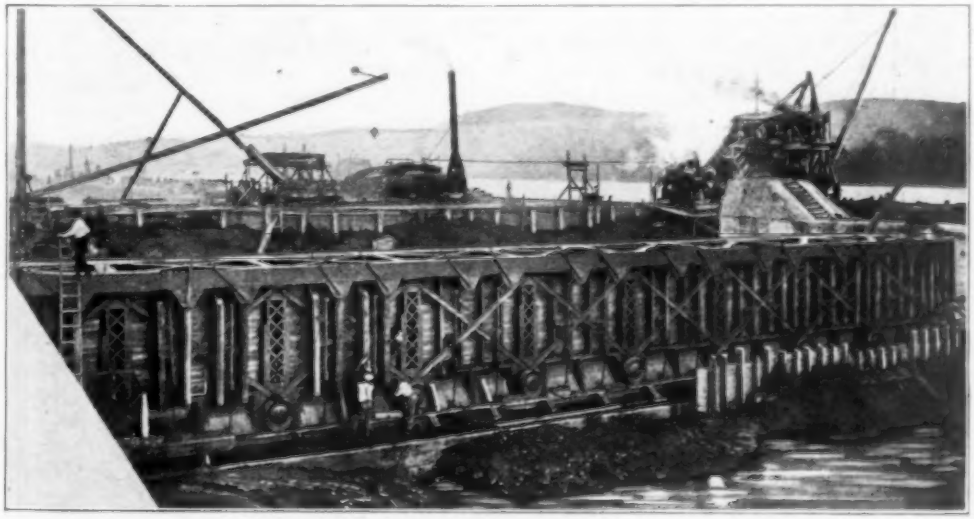
All the pouring is done in the pit, into molds, as in the Bessemer process. The molds are mounted on trucks and taken to the stripper by a locomotive. The ingots are then sent to the blooming-mills, where they are either rolled into billets, Z-bars, I-beams, or slabs. Billets come from the blooming-mills; bars, channels, angles and beams from the structural mills, and slabs from the slab or plate mill. The general operation of these mills is the same. Each mill has its own power furnished by modern high-power machinery. Electricity is supplied from one central power-house, and water from a central pumping station. Large electric or hydraulic cranes handle most of the work.

LARGEST MOVABLE-WICKET CONCRETE DAM IN WORLD

The government concrete lock and dam in the Ohio River at Fernbank, Ohio, about 12 miles down stream from Cincinnati, said to be the largest concrete movable-wicket dam in the world, is now ready for operation. The cost of the work was $1,050,000, and the period of construction six years.

The dam, which is officially known as No. 37, was constructed by the government as a step in making the Ohio River navigable all the year around from Pittsburg, at its source, to Cairo, where it flows into the Mississippi. It gives Cincinnati a permanent river depth of 9 ft., and for a distance of 50 miles up, the stream will always be navigable, no matter how low the water is elsewhere in the river.

In addition to this big dam at Fernbank, the government is building or will soon build 36 smaller dams between it and Pittsburg. Several near Pittsburg have already been completed.



Movable Wicket Dam near Cincinnati

CONCRETE POTATO-PEELING MACHINE

A potato-peeling machine of concrete, the rough interior surface of which constitutes the peeler, is being manufactured by a Chicago concern. The machine is an urn-shaped vessel with a revolving disk in the bottom of the bowl. This disk is driven from below, through bevel gearing, at a speed of 600 revolutions per minute, and spins the potatoes around the inside of the bowl. The rough surfaces of the disk and bowl rub off the skins, and several sprays of water, injected at the upper edge, wash the potatoes clean and carry the refuse out at the bottom.

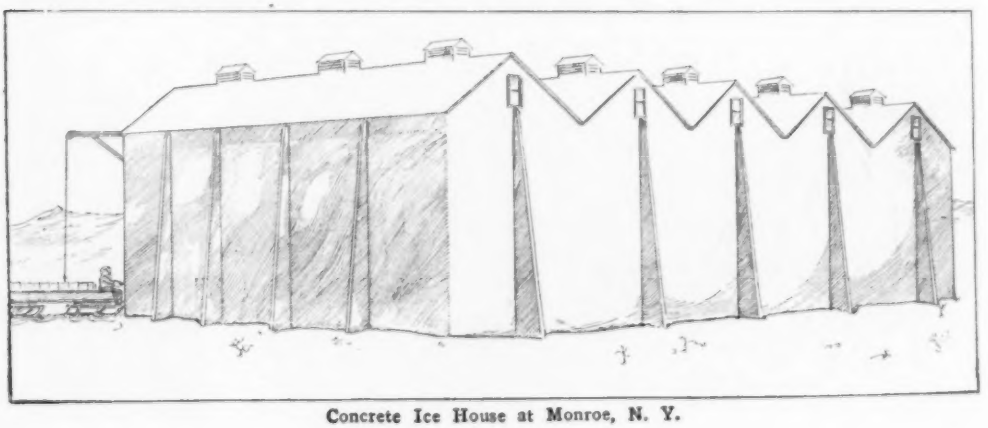
The peeled potatoes are removed and a new batch put in without stopping the machine. A door in the side of the bowl is opened at the proper time and the potatoes are ejected by centrifugal force into a galvanized iron receptacle. A ½-hp. motor furnishes the power, and it is claimed the potatoes are peeled in two minutes. The machines are manufactured in ½-peck, peck, and 2-peck sizes, the former for use in the small restaurant, and the latter for large restaurants and hotels. The machine with a capacity of a peck stands 3½ ft. high.

CONCRETE ICE HOUSES

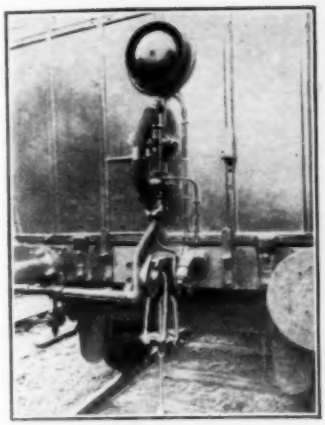
Under ordinary conditions, the cost of construction of concrete ice houses is so much greater than of such structures made of wood that even the saving of insurance, the expense of repairs, etc., would not bring it down to a reasonable figure. The estimates made by contractors in different parts of the country show that the cost is from 25 to 35 per cent higher than for wood, but the plant here illustrated was erected at a cost of 20 per cent less than would have been necessary had wood been used.

The conditions under which it was constructed, however, were out of the ordinary. In the first place, a large sand and gravel bank, within 100 ft. of the building, furnished all the material except the cement, the only expense being in moving it the few feet to the concrete mixer. Secondly, no architects, contractors, or supervising engineers were employed, the company having men of sufficient experience, skill, and ingenuity to do the work, although none of them had ever used concrete before.

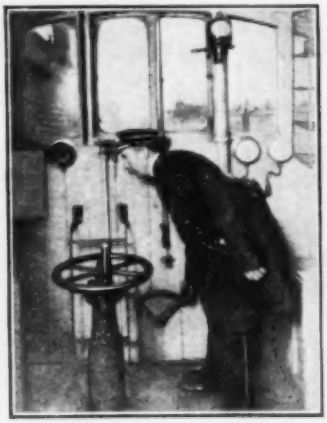
The method of construction, with the side and rear wall wing braces, can be seen in the illustration.



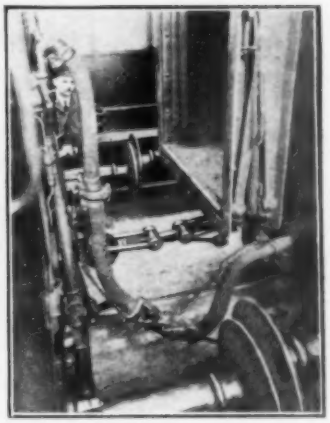
Concrete Ice House at Monroe, N. Y.



Front View of Slip-Coach Mechanism. Above the Break Pipe is the Electric Gong which Sounds Immediately the Coach Parts.



The Guard First of all Pulls over Lever Which Closes Vacuum Break Valve and Sets Pneumatic Slip Apparatus.



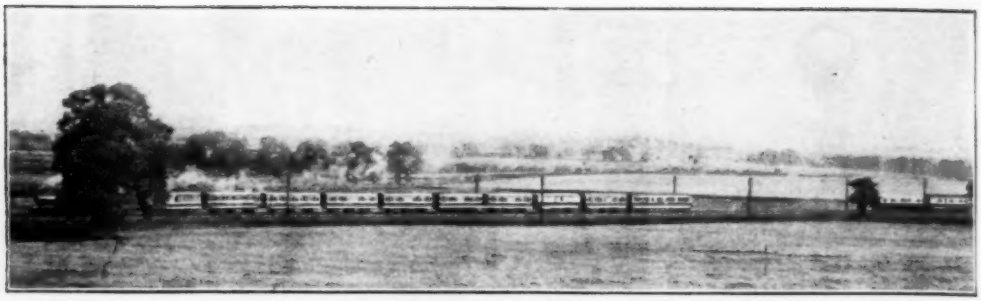
The Ingenious Vacuum Break Coupling.—Vacuum-Break Air Hose, Connected Up, and Rope Which Breaks Hose Coupling.

DROPPING PASSENGER COACHES ON THE RUN

The ingenious means by which one of the great railroad systems of England drops passenger coaches off at intermediate stations without slowing up the locomotive, even for a fraction of a second, in its speed of 60 or more miles an hour, is called the "slip-coach" system. It is a system never tried in America, and consists in dropping, or "slipping," one or more of the rear coaches just before the station is reached. Undoubtedly many American tourists traveling in England, after alighting at their destination, have been amazed to discover that the coach which they occupied was still beside them, while the locomotive and remainder of the train were nowhere to be seen.

The slip coaches are provided with special coupling and breaking mechanisms which are shown in the illustrations. One of the most ingenious of these mechanisms is the vacuum break coupling, by means of which it is possible for the engineer of the train to apply the air brake on the slip coach as well as on the train until a few seconds before the former is slipped. Some distance away from the station, the guard pulls a lever which closes the vacuum break valve and sets the pneumatic slip apparatus. Then he pulls a cord to disconnect the vacuum break coupling, and raises a valve, which causes the hinged portion of the draw-bar hook to drop and the coupling section of the coach in front to fall away. This completes the disconnection, and the main portion of the train, running at full speed, gradually draws away, while the guard manipulates his brakes to bring the slip coach to a stop at the station, judging the distance.

Slip Coach Brought to a Stop at Station



Showing Two Coaches Slipped from Main Section of Train

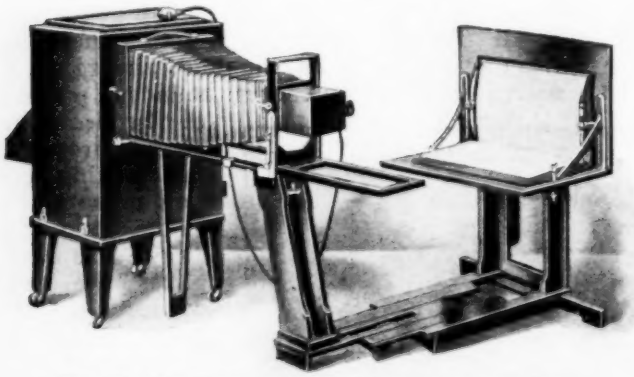
While there might be lines in America where this system could be used to advantage, its success in England is due to local conditions. An express train in this country is as likely to have passengers waiting to embark at an intermediate station as it is to carry passengers wishing to disembark, but in many of the small communities along the lines out of London the passenger traffic is either to London or back home from London. Consequently, trains running out of London at certain hours of the day have passengers to drop at stations where outbound passengers need not be considered, and the slip-coach method of discharge makes possible a very fast schedule.

LARGE SAILING SHIP DISMANTLED

The "Shenandoah," one of the greatest American wooden sailing ships ever built, has been sold for $36,000 and is being cut down into a barge for the carrying of coal along the Atlantic coast. She cost $184,000 when built 20 years ago. Her main truck was 192 ft. above deck, and her main yard 96 ft. in length. She was a four-masted ship and had a spread of 12,000 ft. of canvas.

PHOTOGRAPHIC REPRODUCTION OF DOCUMENTS

Rapid photographic reproductions of written, printed, or typewritten documents may be made with this machine, which develops, prints, and fixes, as well as takes the photographic impression.



This Machine Photographs, Develops, Prints and Fixes

The operation of making a copy of a record or document consists simply in placing the book or loose sheet in the copy-holder, clamping it firmly with the adjustable clamps, and pressing the bulb, which opens the shutter of the lens and allows an image of it to fall upon the sensitized paper. At the completion of the exposure, the shutter is closed by another pressure of the bulb, and the operation turns the crank at the side of the machine until it stops of itself. Then the copy-holder is tilted back, the page of the book is turned, or another loose sheet is placed on the rack, and the operation is repeated.

When the crank is turned following the exposure of the second photograph, the first photographic copy made drops out of the rear of the machine into the receiver.

OVERHANGING PENDULUM ON ELECTRIC CLOCK

Perfection as a time-keeper is claimed for a clock recently made as an experiment in St. Louis, which is operated by electricity instead of gravity. The pendulum is swung over the works instead of under them and its action is controlled by an electric lever. Every time it swings backward and forward, a pin, inserted in the pendulum ball, engages the fork of the movement, on the order of a chronometer escapement. The pallet, which is fastened to the fork, will move the escape wheel every second, as the pendulum swings back and forth. The current operating the lever which governs the pendulum is always the same and therefore the movement of the clock cannot vary the fraction of a second.

MAKING SCIENTIFIC OBSERVATIONS IN THE SAHARA

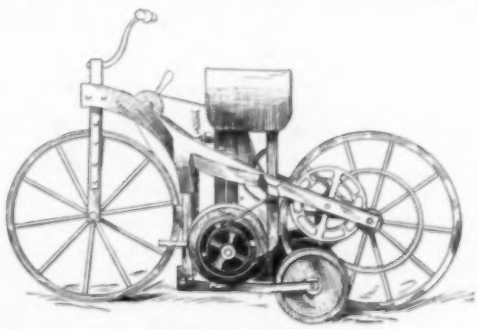
A French expedition under Dr. A. Nodin has succeeded in making important astrophysical and meteorological observations in the Sahara desert. The costumes the party wore and the means of travel, both native, are shown in the illustration. Some of the scientific instruments carried by the expedition were mounted on a camel's back.

Among the points ascertained by the expedition was that condensations and precipitations of vapor of water during the same period of solar and terrestrial troubles are comparable to those which manifest themselves in Europe under the same circumstances.

French Scientist Starting on Sahara Expedition

A MOTORCYCLE OF TWENTY-FIVE YEARS AGO

A motorcycle of 25 years ago, having several features now in use or about to be used on the present motorcycle, is here illustrated. The power plant was a ½-hp. engine using kerosene as fuel, the belt drive was very much like that approved today, and the small auxiliary wheels to prevent skidding are not unlike those now coming into use on the most improved types of British motorcycles.



Motorcycle of 1885

FOUR YARDS OF BEARD

A beard that is more than twice as long as its owner is tall is the boasted possession of Valentine Tapley, a resi-

Record-Breaking Beard

dent of Frankford, Mo. It is exactly 12 ft. long, and has to be wound around the waist or hung about the shoulders to keep it from trailing.

TWO WAYS OF FIGURING TIME IN TURKEY

For centuries the method of reckoning time in Turkey has been based on the assumption that the day ends and the new day begins at sunset, which is called 12 o'clock. Following the lead of the people, who seldom had watches or clocks and judged the time by the position of the sun, the civil and religious administrations used the same system, and clocks and watches made to keep regular mean time had to be changed almost daily to adjust them to the sun.

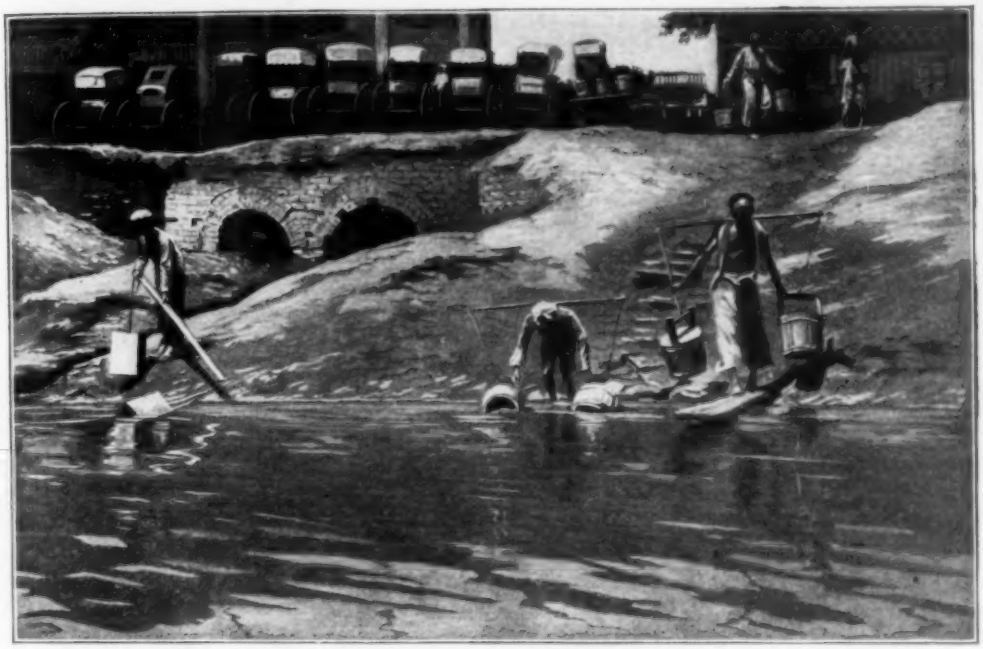
Now, however, the accurate and scientific reckoning of time as adopted by modern countries is coming into use in the Ottoman empire, although the government has decided not to impose the change by law. As a result, combination timepieces, which show both the time by the sun and the standard time, are in demand. There are three types of timepieces for this purpose. One has two dials, one on each side; the second has two small dials side by side on the same face, and the third has a central fixed dial for regular time, and around it a movable dial for Turkish time.

The standard time will be introduced gradually, and the period of transition will probably extend over several years, during which time both systems will be in use. The building of railroads, which must have accurate and uniform time, will tend to introduce the new system, various administrations have already adopted it, and many of the schools are preparing for the change.

ELECTRIC ADVERTISING SIGNS AT SEA

It has been proposed to erect large electric signs on barges, with the necessary equipment for generating current, and to either anchor them off shore or propel them slowly back and forth in front of the famous boardwalk at Atlantic City. The local authorities at Atlantic City, however, are opposed to the plan, and have strenuously protested to the War Department to stop any such move. Just what right the government may have to interfere is discussed as follows by the Illuminating Engineer:

"From a technical point of view, it is difficult to see what the War Department can do in the matter, except to treat it strictly as to its effect upon navigation. The right of the government to police all waters, within three miles from shore, is unquestioned, but whether this police supervision extends



Chinese Taking Water from Stream Near Sewer

farther than keeping the regular channels of navigation open, may seriously be doubted. A single float, exhibiting an electric sign and anchored off shore, or propelled by licensed navigators, could hardly be called an obstruction to navigation. The real question is, what would happen if other similar enterprises were inaugurated to an unlimited extent? Suppose, for example, that instead of one there were a whole marine parade of such barges, passing back and forth in front of this, or any other resort, every night when the weather permitted. Would it be one of the spectacles which people would gather to see, or, by obstructing the view of the ocean itself, would it become an intolerable nuisance?"

CHINESE WHO DO NOT FEAR THE SEWERS

In this illustration, at the left, is shown the main sewer of the native section of Tientsin, China, emptying into the Peiho River. Almost in front of the sewer, water carriers may be seen getting water for drinking purposes. They are on the upstream side of the sewer, but the current is sluggish and the water carries a considerable amount of sediment. This is settled by letting the water stand in large earthen jars, alum being added to hasten the process.

THE USES OF OLD ROPE

Old rope, like old tin cans and other things generally considered as waste, has its special market and uses, and in every seaport the collecting and classifying of old rope is an important business. Rope covered with heavy applications of tar or graphite is even more valuable today for making oakum than lightly tarred material, while hemp rope with the original heavy coating of tar worn off by weathering is often used for bag paper. A small percentage of untarred hemp rope, used in its prime for hoisting and other such purposes, is being converted into cigarette paper in Europe. Scraps and waste from old tarred rope, and also old oakum removed from the seams of ships, are now used for making boards,

FASHIONABLE VEHICLE OF '50'S PROVES DURABILITY

That the carriages of our forefathers were built for durability as well as style is shown by the fact that a carriage built for Stephen A. Douglas in the '50's recently carried four persons in a parade at Grand Rapids, Mich. The carriage was used by a local political organization, it having special significance owing to the fact that it carried Abraham Lincoln and Stephen A. Douglas to their seven joint debates in the fall of 1858. The vehicle cost Douglas $750, and at that time it was considered the finest carriage in the middle west. Lincoln didn't have money to hire a carriage and it was by invitation of Douglas that he rode in this one.

Making Plaster Mold of Sculptured Form

Once Considered Finest Vehicle in the Middle West

MOUNTING THE SKIN OF A GIANT HIPPOPOTAMUS

The mounting of the skin of "Caliph," the hippopotamus which was for 30 years the center of attraction in the New York Zoo, presented many difficulties, all of which, however, have been successfully overcome. The great beast was said to be the largest hippopotamus in the world, being 12 ft. long, 14 ft. in circumference, and weighing four tons. During the first stages of building up the form for the skin, the interior of the plaster body resembled a section of a subway, and six workmen with electric arc lights could move about with ease in the spacious interior.

In the illustration may be seen the giant clay-sculptured form being partly covered with plaster to obtain a mold. It was necessary to make the form in sections, which were afterward assembled. Plaster was then applied to the interior surface of the molds, thus securing the light but firm completed structure.

The working of the huge skin into the numerous deep folds and wrinkles, especially around the massive head, neck and legs, was most difficult. The skin weighed 1,200 lb. when first removed from the body, and in some parts was 6 to 8 in. thick. Six men, working four days, shaved it down to from one-quarter to one-half inch in thickness, and to a weight of 68 lb.

TOY BLOCKS MADE OF CORK

A German toy-maker is manufacturing building blocks of cork as substitutes for the so-called stone building blocks, made of cement or concrete. The cork blocks, unlike the heavier articles, do not scratch the finish of floors or tables.

Photo by Paul Thompson, N. Y.

Moving Target Scenery Painted by W. Z. Wyllie, R. A.

ARMY TARGET PAINTED BY FAMOUS PAINTER

The Hampshire Fortress Engineers, of the English territorial army, which corresponds to the national militia of this country, enjoys the unique honor of having had the scenery of its miniature rifle range painted by a member of the Royal Academy. It was executed by none other than W. Z. Wyllie, R. A., whose marine scenes are considered among the finest paintings of present-day artists.

The reason for the honor lies in the fact that Mr. Wyllie is a keen citizen soldier as well as a great painter, and holds the rank of captain in the Territorial Engineers. The scenery of the moving target, which is shown in the illustration with the painter and several of the engineers before it, is a reproduction of the undulating lines of the Portsdown Hills, and has been beautifully executed.

¶The president of Cuba has appointed a commission to consider plans for the construction of the new $500,000 presidential mansion to be built from surplus lottery funds.

EMERGENCY LIGHTING OF PASSENGER SHIPS

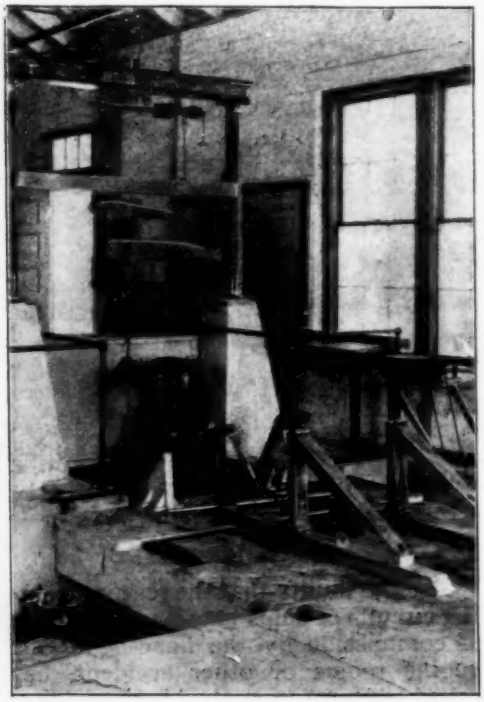
The possibility that the regular lighting circuits of ships may be thrown out of commission by the flooding of the engine rooms or other accident, has called forth many methods of providing emergency lighting.

One of the most interesting is that in use on the passenger steamer "Alabama," which runs out of Chicago to ports across Lake Michigan. A storage battery of 56 cells, capable of supplying 25 4-cp. lamps for 10 hours, is mounted at the highest point of the upper deck, and charged during the day from the ship's generators. The lamps, distributed along the corridors, are kept lighted every night, so that, should the regular plant be rendered useless, sufficient illumination is assured, without the manipulation of switches or automatic devices.

On some of the transatlantic liners, the emergency lights are oil lamps. These are lighted at the same time as the electric lamps, so that, regardless of a possible shutting off of electric current, there will not be a moment of darkness.

UNIVERSITY INSTALLS AUTO-TESTING PLANT

An automobile-testing plant, unique because of its setting and because auto-



Automobile Testing Apparatus of University of Kentucky

mobile owners are asked to have the horsepower of their machines tested free of charge, has been installed at the University of Kentucky, which institution purposes to do considerable research work on the subject of power-plant efficiency.

The plant is so arranged that an automobile can be mounted on two drums revolved by a shaft, the other end of which contains a friction brake. The automobile is held in place in such position that the centers of the rear axle are directly over the centers of the shaft carrying the drums, this axle being connected to a system of levers which is in turn connected to a scale. The scale system is so sensitive that one-fourth of a pound pull can be accurately measured. By means of instruments, it is possible to determine the horsepower of a machine under any conditions of operation, within an accuracy of one-hundredth of a horsepower. The distance traveled by the tread of the rear tires is measured by a recording indicator.

NAVAL TESTS OF INTERNAL-COMBUSTION ENGINES

The conclusions drawn from the series of tests made at the Norfolk, Va., navy yard, to determine the suitable types of internal-combustion engines for naval service, are of much interest and importance to all users and prospective buyers of heavy and medium-duty gasoline engines.

The tests demonstrate, according to Lieut. W. G. Diman, in the Journal of the American Society of Naval Engineers, that no gasoline engine with revolutions above 500 per minute should be installed in any heavy-duty boat, as reliability and durability are most important. The moving parts should be the same as in a standard marine engine, and to box them up in a crankcase is absurd. If a reliable engine is desired, it must be a slow-running one that will have heavy and large parts to meet all requirements. Race-boat weights may run from 10 to 19 lb. per horsepower, but this must not be considered a satisfactory machine for service conditions. Light high-speed engines for heavy and medium-duty boats are not satisfactory for continuous use. They will always give trouble and should never be placed in anything but a speed boat. For all around work, no four-cycle engine, weighing less than 35 lb. per horsepower, should be placed in any boat.

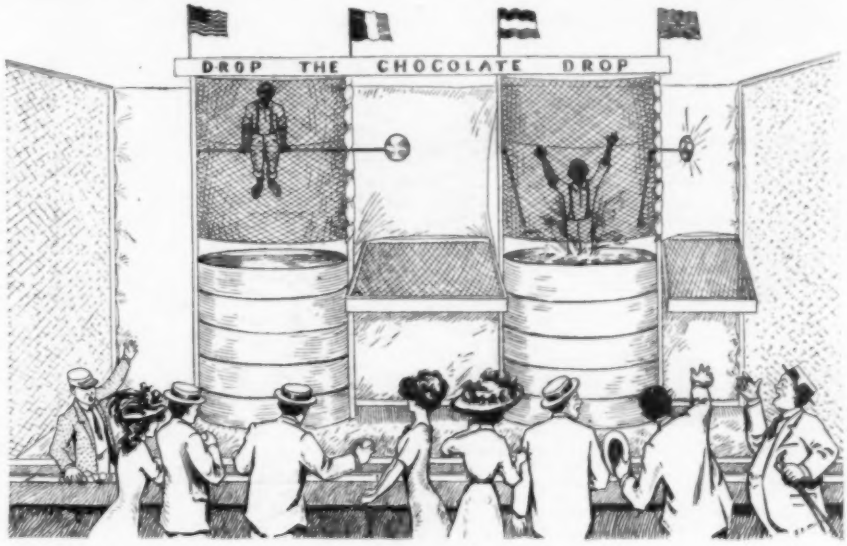
There is a tendency on the part of all gasoline and oil-engine manufacturers to install a number of fittings which are not necessary for perfect operation, says the report. This increases complication without giving better results. There should be nothing in connection with a gasoline-engine equipment that is not absolutely necessary to its running efficiency, and the simpler the installation the better.

SUCCESSOR TO THE "AFRICAN DODGER"

The demand of the public for continual change in the means of amusement leads to many curious amusement ideas, an example of which, very popular at a Chicago amusement park, is shown in the accompanying illustration.

The "African dodger," a game in which a colored man places his head through a hole in a canvas curtain and endeavors to dodge the missiles thrown in his direction, became too old and commonplace to create sufficient interest, therefore, this new idea was evolved. Stretched above a tank of water is a board arranged very much like a trap door. Upon this board the victim sits while the players endeavor to hit a target, placed on the side. Every hit trips a mechanism which causes the board to drop, tumbling the colored man into the water.

The outfit at the Chicago amusement park consists of two such units, so that, when one victim is in the water, another is in position to be tumbled.



Amusing to All but the Victim

HANDCUFF WITH EVERY FIRE ALARM

For a person to be presented with a handcuff every time an alarm of fire is sent in over the wires from a street box, and to receive it in such a manner that to refuse the gift is impossible, seems a rather extraordinary proceeding. Yet such a gift is one inventor's idea of the only way to effectually provide against false alarms.

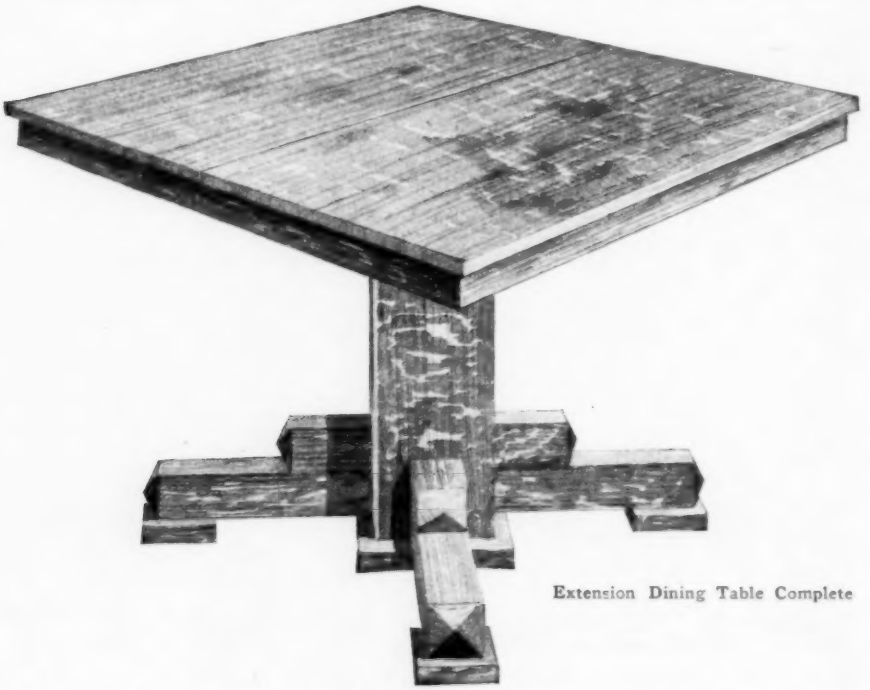
The special handcuff firebox is provided with a cover, which the operator must raise. He is then required to push a button to send in the alarm, which action also causes a handcuff to fasten itself about his wrist. The handcuff, merely being for identification, is not chained to the box, so the person sending in the alarm carries it away with him. It is a handcuff difficult to conceal, being quite large, and must be unlocked by the fire chief. If there is a fire, the wearer of the handcuff is thanked for his presence of mind, but if the alarm is false, a search is immediately begun for its wearer and he is dealt with accordingly.

WIRELESS TELEPHONES FOR USE IN MINES

Experiments carried on near London, Eng., to determine the practicability of the wireless telephone as a means of communication in coal mines, are said to show that instruments of a size that can be grouped into portable form may be successfully used. To give the special apparatus a thorough test, instruments were placed about 1,600 ft. back and at a depth of 100 ft. in the Chislehurst caves and on the top of a hill about a mile away. In the caves, the lines from the instrument were connected with two pitch-forks, driven into the chalk, while the lines from the instrument on the hill were connected to a few 3-ft. stair rods, stuck into the soil. The current was easily picked up and returned, and the two parties communicated without trouble. One of the coal companies in South Wales has contracted for instruments, and will use them in emergencies for intercommunication between the galleries and between the galleries and the pit mouth.

HOW TO MAKE AN EXTENSION DINING TABLE

The accompanying sketch and photograph show a simple design of an extension dining table of the mission style. It is very easy to construct and can be built at home by anyone who is at all handy with tools. It should be made of quarter-sawed oak, which can be secured at the mill ready cut to length, squared and sanded. Order the following pieces:



Extension Dining Table Complete

2 top pieces, 1 by 23 by 46 in.
2 extra leaves, 1 by 12 by 46 in.
2 rails, ¾ by 3 by 44 in.
4 rails, ¾ by 3 by 22 in.
2 pieces for posts, ¾ by 8 by 24 in.
2 pieces for posts, ¾ by 6 by 24 in.
4 pieces for feet, 3 by 3 by 14 in.
4 pieces for feet, 3 by 3 by 5 in.
4 pieces for feet, 1 by 4 by 4 in.
4 pieces moulding, 1 by 1 by 10 in.
1 piece, 1 by 12 by 27 in., birchwood.
2 brackets, ¾ by 3 by 32 in., birchwood.
2 pieces for slide, 1¾ by 3 by 36 in., birchwood.
4 pieces for slide, 1 by 3 by 36 in., birchwood.
12 pieces for slide, ¾ by 1½ by 36 in., birchwood.

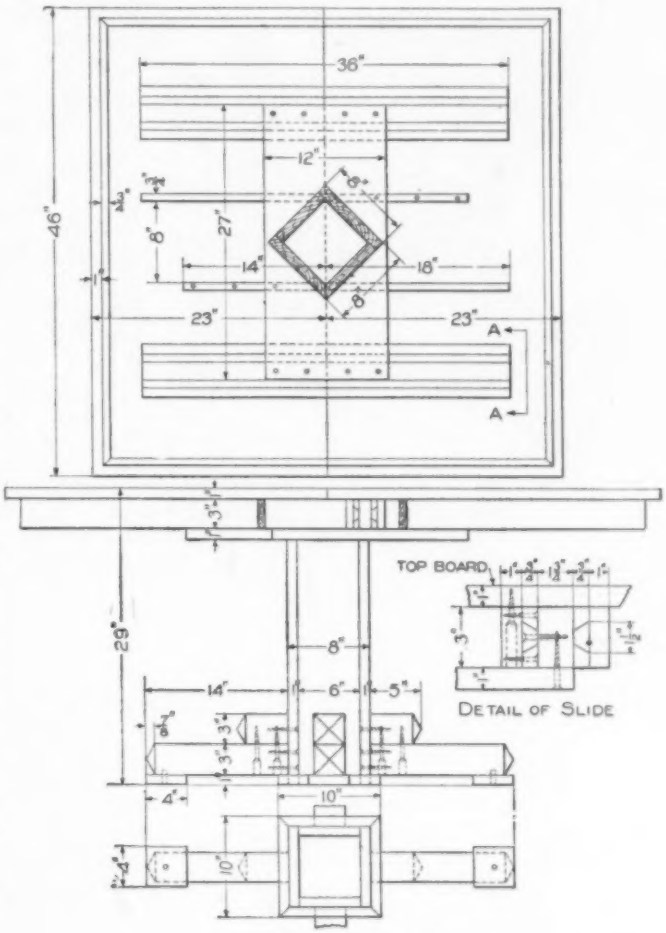
The feet can be made first by squaring up one end of each and beveling the other as shown in the drawing. The short pieces are fastened to the long

ones by means of long screws and glue. The four square pieces should be nailed to the outer ends and holes bored in them for the casters. Prepare the pieces for the posts, and before nailing them together fasten the feet to them with long screws. Be careful to get them on square, else the table will not set level when complete. Now nail and glue the pieces forming the table together and fasten the moulding at the bottom. This moulding should have mitered corners as shown in the bottom view. Also fasten the rest piece to the top of the post, using long screws and glue.

The slides can be made next. The pieces are made and fastened together with screws as shown in the enlarged detail view. This slide, if made with care, is a good one. The center piece should be firmly fastened to the post rest with long screws. The screws that fasten into the top should be inserted from below through counter-bored holes as shown.

Miter the rails at the corners and glue them to the top. Blocks can be used on the inside if desired, which will make a much stronger construction. Screw the two brackets to the top as shown. These help to support the table when it is extended.

When complete, the table should be carefully gone over with fine sandpaper, and all glue and rough spots removed. Apply stain of the desired color. This can be any one of the many mission stains supplied by the trade for this purpose.



Details of Dining Table

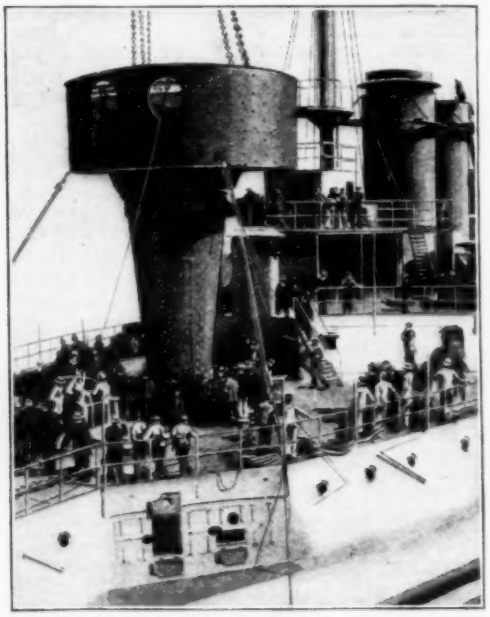
SUBMARINES TO SERVE AS WATER CARRIERS

Two of the oldest submarines of the French navy, the "Gymnote" and "Gustave Zedel," are being converted into tank vessels for the carrying of water, which is a strange fate indeed for craft built to travel under water. Purposely using their holds for water, however, is a fate less tragic than that suffered by several French submarines, notably the "Pluviose," the flooding of whose holds caused many deaths.

¶An English motorist is to undertake to drive an automobile from the Cape to Cairo.

PLACING A TURRET ON FRENCH BATTLESHIP

The lowering into position of a great two-gun turret on the French dreadnought, "Voltaire," may be seen in this



Funnel-Like Shape of Battleship Turret

illustration. The long stem, giving the turret a funnel-like appearance, goes down into the hold, the turret when in place being no higher above the deck than those of the fighting ships of other nations.

NAMING MOTORCYCLES A NEW CRAZE

Here and there in this country may be found a motorcycle bearing a name, but in England the idea has developed into a craze that is spreading like wildfire, and may be taken up enthusiastically in this country, should some scheme of registering be decided upon.

Wherever motorcycle enthusiasts meet in England the naming of machines is the topic of conversation, and nearly every machine now has its name painted on the gasoline tank. Registration headquarters have been arranged and no name is accepted for record that has already been registered by some one else.

The names given the machines by their owners are of a varied nature, including the humorous, the appropriate, and the grotesque. Among the hundreds of names already registered are found "Grey Ghost," "Fossil," "Puffing Billy," "P'raps," "Red Rat," "Autogo," "Tired Tim," "Gatling Gun," "Flying Dutchman," "Mighty Atom," "Red-ot," "Creeping Jimmy," "The Snail," "Non-Stop," "Rob Roy," "Salome," and "Arrow."

IRON REMOVED FROM GRAIN BY MAGNETS

Explosions in flour mills and breweries, often caused by nails or iron particles that find their way into the grain, and which, when they strike the steel rolls of the mills produce sparks and ignite the finely pulverized material about them, have resulted in an electro-magnetic method of removing such foreign matter.

A large malting concern, according to the Engineer, was so troubled by such explosions that all the grain is now passed over magnets before being prepared for shipment to the breweries.

Where the Motorcycle Names are Placed

The cleaning capacity of the electromagnets installed is 800 to 1,000 bushels per hour. When the magnets have collected a large amount of metal, they are swung to one side and swept clean.

CHINESE PLAY FRENCH ARMY GAMES

Of all the foreign soldiers quartered in the principal cities of Northern China as a preventive against Boxer uprisings, the French are said to be the most welcomed by the natives, many of whom enter into the sports of these guardians of peace.

The two games pictured in the illustrations are very popular in the French army, and doubly so in China where the natives, young and old, take part. One of them is a thread-eating game, and in the other the players strive to bite coins from a sticky, sooty hanging object.

In the former, cotton threads, all of equal length, are tied about 3 ft. apart to a rope stretched along the ground. The participants in the game take the loose ends in their mouth, and, at the given signal, commence to chew it up. The thread is chewed up into a wad, not swallowed, and the participant reaching the rope first wins the prize.

Thread-Chewing Contest

In the other game, a cardboard box or other like object is coated with a sticky, sooty substance, and against this surface coins are stuck. The box is then suspended at the proper height, and two participants at a time try to acquire the coins by biting them off. The box is swayed back and forth by the efforts of the participants, and by the time the coins are all captured the sticky, sooty substance is plentifully daubed over their faces, to the great amusement of the onlookers.

Acquiring Coins under Difficulties

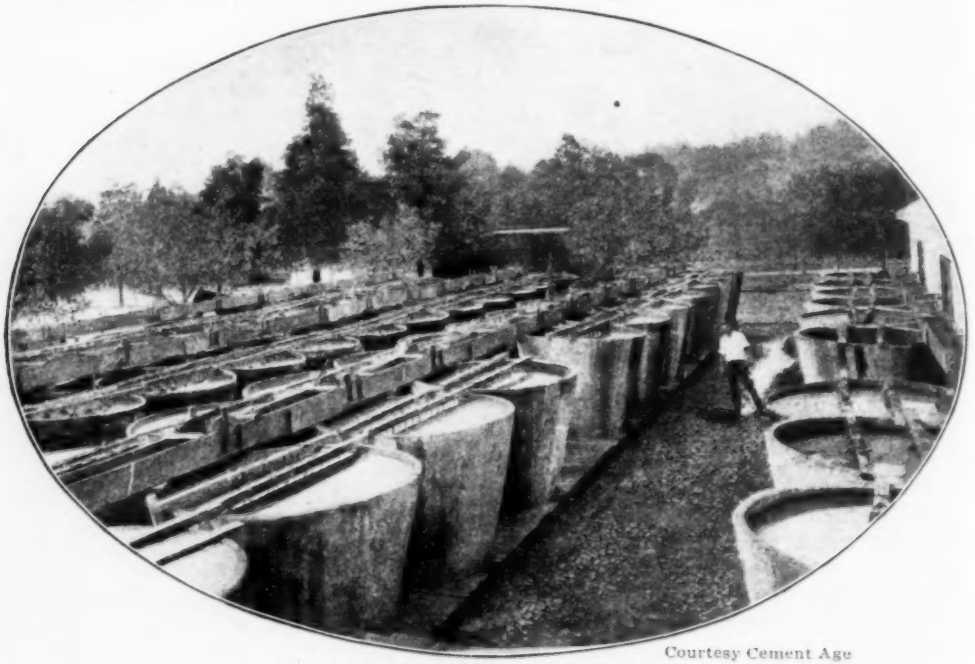
Since the year 1900 the powers have maintained an army of occupation in Northern China.

COLOR DESIGNS "FIRED" INTO THE GLASS

A new form and method of making stained glass, said to be far superior to the ordinary stained article with heavy lead and metal lines, has been adopted by an American concern. The glass itself first receives the pattern in mineral pigments, and it is then "fired" into the glass by heat so intense that glass and color become fused into an impervious whole. At the same time the face

of the glass receives a curiously pebbled surface which gives the colors a softened, mellow character.

Each panel is bent separately into shape by the application of heat and is complete in itself, requiring only to be assembled in a metal frame to form the complete picture. Every part of the pattern is said to be transparent, no matter how intricate the design.



Courtesy Cement Age

Reinforced Concrete Cream of Tartar Vats

MAKING CREAM OF TARTAR IN CONCRETE VATS

One of the important by-products of the great wine colony at Asti, California, is cream of tartar, obtained from the lees or sediment of the new wine. Nearly 50 reinforced concrete vats, 4½ ft. in height, 19 ft. top circumference, and 13 ft. at the bottom, receive the hot lees, carried to them from the distillery by a sluice system.

The liquid is allowed to stand in the vats until it is as cool as the atmosphere will make it, the time usually required being five or six days, during which period the cream of tartar is precipitated. The crystals adhere to the bottom and sides of the vats and to whisks of hemp suspended from the center.

The size of the vats as compared with that of a man is shown in the illustration.

WOODEN WATER PIPES TO BE USED IN AUSTRALIA

Wooden water pipe, ranging from 3 to 12 ft. in diameter, is being manufactured by a new factory in Sidney, Australia, to supply the requirements of inland towns, mines and industrial concerns. In some of the important towns, large steel pipe laid down several years ago is actually crumbling to dust, and it is expected that the wooden pipe will more effectively resist decay.

The lesser cost of wooden pipe and its transportation are also important factors. Many towns wish to install pipes, but have not the taxing power to do so. It is estimated that with inland towns a saving of 50 per cent of the cost of metal pipe is possible. A 3-in. wood pipe to withstand a 100-ft. head pressure, for example, would cost

about 21 cents per foot, while cast-iron pipe for the same requirements would cost approximately 45 cents, and steel 38 cents. A 12-in. wood pipe costs 72½ cents, against $1.55 for cast iron. The saving in freight is also a big item, the 3-in. wood pipe weighing but 4 lb. per square foot as compared to the 12 lb. per square foot of cast iron. The 12-in. wood pipe weighs 15 lb. per square foot, as compared to the 77½ lb. of cast iron.

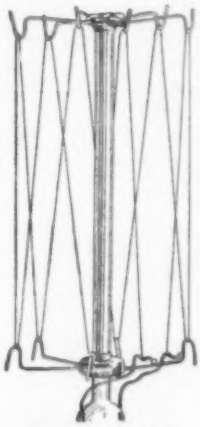
The process of manufacture is very similar to that of the wooden stave pipe used for the great pipe lines in the western part of this country. The stave pipe is dressed on both sides with galvanized steel wire, and then covered with a heavy coating of bituminous composition and wrapped with hessian cloth.

IMPROVEMENT IN MOUNTING TUNGSTEN FILAMENTS

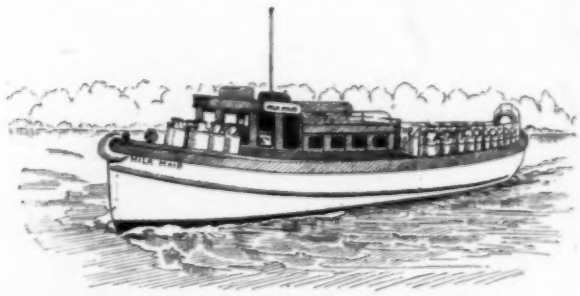
The only drawback to the tungsten lamp is its fragility. A slender rod or thread of it has a comparatively great tensile strength and can be bent, but it is fragile and a slight blow shatters it. Much of the breakage, however, is due to the ordinary method of mounting the filaments in the lamp, which has now been improved in what is known as the wire type.

The ordinary method is to mount the filaments (which are made in short lengths of hairpin shape) with the ends passed through metal balls fused at the ends of the supporting wires, thus making a total of eight or ten points of rigid support. The "wire type" of filament, which is continuous, is made possible by the development of a new method of manufacture by which it is produced in lengths. A few turns near each end of the filament are wound in the form of a spiral spring around the respective leading-in wires. Consequently, a slight bending of the filament from a blow or vibration does not act directly upon the fused joint, as it would if a straight part of the filament came directly from the fused joint as in the ordinary construction, but upon the spiral spring.

Old Method of Mounting Tungsten Filaments



New Method of Continuous Filament



Transporting Milk by Motorboat

A MOTORBOAT MILK MAID

This powerful 45-ft. motorboat, appropriately named the "Milk Maid," gathers the milk output from the pasture lands along the Sacramento River and delivers it each day to the city of Sacramento. Put into service as an experiment, it has reduced the cost of milk transportation to about one-half as compared with the old method of shipping by rail. The boat makes two 20-mile trips, absolutely on schedule, seven days a week, driven by her 54-hp. engine at a speed of 14 miles an hour, and has a carrying capacity in milk cans of 600 gal.

UNDER-WATER WEED-CUTTING DEVICE

An inexpensive weed-cutting device, designed for the clearing of small lakes, ponds, and streams, is being placed on the market. The cutting knife, 5 ft. wide, and shaped somewhat like the blade of a skate, is rigged to a standard fixed in a central position on the bow of the craft being used for the operation. It will cut weeds at a depth of 6 ft., the knife working with an oscillating motion, due to its peculiar shape.

TWO AUTOMOBILE FLUSHERS FOR TORONTO

Two automobile flushers are now being used for the cleaning of the streets in Toronto, Canada. Driven by 40-hp. engines, the two machines work in company, one going ahead and loosening the dust while the second follows about ten minutes later and washes it to one side. A 60-ft. street can be flushed from curb to curb in one trip, the tanks having a capacity of 1,200 gal., and the machines traveling at a speed of eight miles an hour while operating.

SIAM'S EXPORTS OF BIRDS' NESTS

The nests of a species of birds belonging to the family of swifts, and inhabiting the islands off the coast of Siam, are delicacies which the Chinese consider very fine in the making of soup. The demand for the nests in Hongkong so exceeds the supply that the prices range from $15 to $25 per pound, according to quality, while the average price for the total annual product is about $7 per pound.

The export of bird's nests from Siam during the last year amounted to 17,781 lb., valued at $109,848, most of which was used by the Chinese cities. The nests consist almost entirely of the salivary secretion of the birds, whose glands are much more developed than those of the ordinary swifts. The season for the gathering of the nests begins in April and ends in September. The Chinese regard them as a valuable tonic as well as a delicacy.

Auto Water Wagon

The Manufacture of Artificial Ice

By J. GORDON OGDEN, Ph. D.

Professor of Physics, Fifth Ave. High School, Pittsburgh

MAN has always been able to provide against the rigors of winter, and to protect himself from the inclemency of the weather when the sun has withdrawn its kindly influence. Whether it was the cave of our remote ancestors, or the steam-heated apartments of today; the skins of animals, or the finely woven cloth of modern times, man has always been able to fight his mortal enemy, cold. On the other hand, he has been practically at the mercy of the broiling sun during the summer season, for thousands of years. Occasionally he stored up some of winter's ice in caves or ice-houses, or else brought it at great expense or trouble from the glacier fields, if they chanced to be within a reasonable distance. The great mass of humanity, however, had to stand the baking and the sweltering, with as little perspiration and as much philosophy as possible, until the advent of artificial ice.

Today, every city, town, or village has its up-to-date ice plant, and ice within the past quarter of a century,

FIG. 1

The watch crystal contains ether. The rapid evaporation produced by blowing upon it, causes a thin film of water between the watch crystal and block of damp wood to freeze.

has become a necessity instead of a luxury.

The principle involved in the manufacture of ice is exceedingly simple. Withdraw sufficient heat from water—the result is ice. The tiny little quiverings that constitute heat are the arbi-

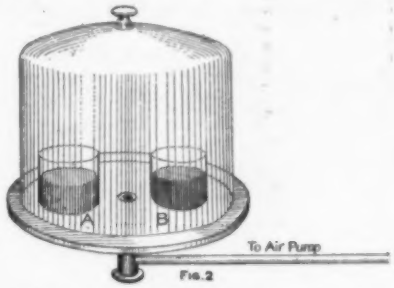


FIG. 2

A contains water; B, sulphuric acid. The lowering of air pressure and consequent evaporation of water, causes the remaining water to freeze. The acid absorbs the vaporized water.

ters that determine whether a body shall be solid, liquid, or gaseous. Man has known this for centuries, but it is only within comparatively recent years that he has made practical use of his knowledge.

Professors in hundreds of colleges and high schools, during the past century, have produced ice artificially before their classes, but the operation ended with the formation of a thin sliver of ice in the heated class room. The pupils were duly impressed, exclaimed: "Wonderful,"—and then passed on to the next experiment. No one bothered about the important principle that had just been demonstrated. No one thought of its meaning and its possibilities. No one saw in it the lessening of infant mortality, the husbanding of perishable products of farm and mill, and the possible addition to the sum total of the world's happiness and comfort.

Figure 1 is a representation of the simple apparatus by which ice in small quantities may be made experimentally. A thin watch crystal, covered with a film of water on its lower side, is placed on a block of moist wood. A little

Copyright by H. H. Windsor

ether is poured into the glass, and a blast of air is directed against the ether. The ether rapidly evaporates owing to the relatively large volume of air that comes into contact with it. There is a price to be paid before a liquid can become a vapor or gas. This price is heat. We see this illustrated every day in the kitchen when the housewife boils water on the hot stove.

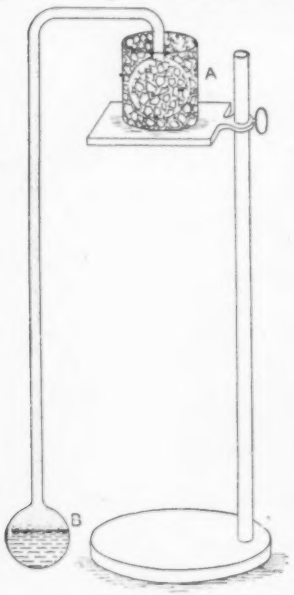


FIG. 3

A is empty, except for water vapor. It is surrounded by freezing mixture. Ice forms on surface of water in B

The ether has to steal the heat necessary to enable it to soar into the kingdom of vapor, and it steals it from the nearest object, namely, the watch glass. The watch glass, in turn, robs the thin film of water underneath of some of its heat, and as a result, since the water has lost the vibrations that enabled it to exist as water, it is reduced to ice.

Figure 2 represents another experiment, full of significance, and performed millions of times in the last century. A glass of water is placed under the bell jar of an air pump, and beside it, a cup of sulphuric acid. When the air is withdrawn from the receiver, the lessened atmospheric pressure on the water stimulates evaporation. The water in the glass takes advantage of the excursion rates into the vapor state, borrows the price in heat units from the water remaining in the glass, and evaporates. The sulphuric acid promptly absorbs the venturesome vapor, leaving the air in the receiver as rarefied as before. More water evaporates, all at the expense of the water remaining in the glass. Finally enough heat units are taken from the water to lower its temperature to the freezing point. Further evaporation produces ice.

About 40 years ago, Edmund Carre, a Frenchman, made use of the principle involved in the above experiment, in freezing water in decanters for use in the restaurants of Paris. The apparatus employed by Carre resembled a small steam boiler. This was partly filled with pure sulphuric acid and connected by pipes with an air pump and the flask containing the water to be frozen. The working of the pump caused the water to freeze by self-evaporation, the vapor being taken up by the concentrated acid. The acid was constantly agitated to prevent the formation of a layer of dilute acid on the surface. By this method ice was made at a cost not exceeding one-half a cent per pound, as the dilute acid produced in the operation could readily be sold for a variety of purposes, and was in no sense a waste product.

Another experiment that has delighted and bewildered the boys and girls of our higher schools for many decades is that of the cryophorus. With this bit of simple apparatus, ice has been made to appear in a hot classroom, right before the eyes of the interested students, even though the freezing mixture used was quite remote from where the ice finally appeared. It consists of a sealed tube with bulbs at either end. Only water and the vapor of water is contained in the apparatus. All the water is first shaken down into the lower bulb. Then the upper bulb is placed in a freezing mixture of ice and salt, as shown in Fig. 3.

In a few minutes, crystals of ice appear in the lower bulb, contrary to what the average person would expect, as the water thus frozen is far as possible from the freezing mixture. This is the explanation. The freezing mixture around the upper bulb rapidly

cools the invisible water vapor in the upper bulb, and causes it to condense. This lowers the vapor pressure on the water in the lower bulb, and renders its evaporation more easy. Evaporation rapidly follows as a consequence and the vessel is soon filled again with water vapor. Evaporation requires heat. This heat is taken from its only possible source—the water remaining in the lower bulb—and as this process goes on continuously, this same water is robbed of its heat units, sufficiently to cause it to go into bankruptcy, in other words, into ice, and the mystery is explained.

We are all quite familiar with the pulse glass shown in Fig. 4. This apparatus has something very important to tell us in our study of the manufacture of artificial ice. The liquid contained in the pulse glass is sulphuric ether which boils at the low temperature of 95 deg. F., just about three degrees below the normal temperature of the human body. When the hand is placed around the bulb containing the ether, the ether rapidly moves over to the other bulb, where it soon begins to boil vigorously. At the instant the boiling begins, the hand on the empty bulb experiences the sensation of extreme cold.

As a matter of fact, the ether abstracts some of the heat from the hand in order that the boiling (evaporation) may go on, thus showing in an objective way, that heat is necessary to change a liquid into a vapor. Another fact of great importance that must not be lost sight of is that heat is required not only to change a solid into a liquid, or a liquid into a vapor, but also to permit a vapor or gas under great pressure to assume a condition of less pressure—in other words, to allow it to expand. Compressed air, for example, if released through a small orifice will expand, but the expansion is at the cost of sundry heat units that will be absorbed from any substance capable of parting with them in the vicinity of the expanding air. As a matter of fact, compressed air is one of the first gases used in the manufacture of artificial ice, but compressed air has given place to other gases that use the latent heat of gases rather than their sensible heat.

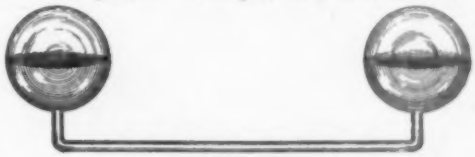


FIG. 4
Pulse Glass

There are practically only three substances that are used today as ice-makers and of these three, the last is by far the favorite. These substances are: liquid carbon-dioxide gas (the gas that is dissolved in water to form "soda water"); liquid sulphur-dioxide gas (the gas that is formed when sulphur is burned in air); and liquid ammonia gas.

Of course ether is a first-class refrigerant, but the comparatively high cost of this substance, and the fact that it forms a highly explosive mixture with ordinary air, puts it out of the running with its rivals. The objection to carbon-dioxide is based on

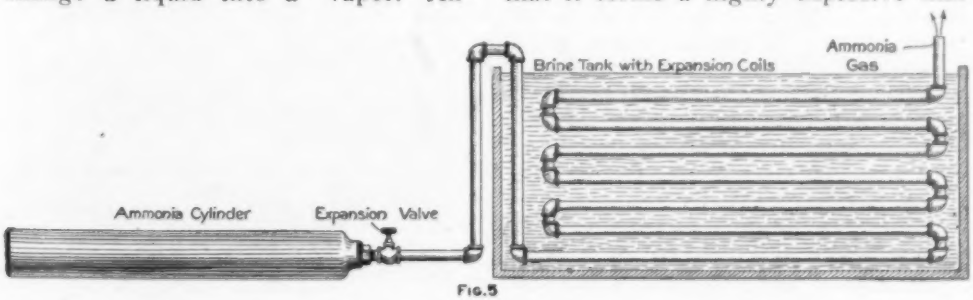
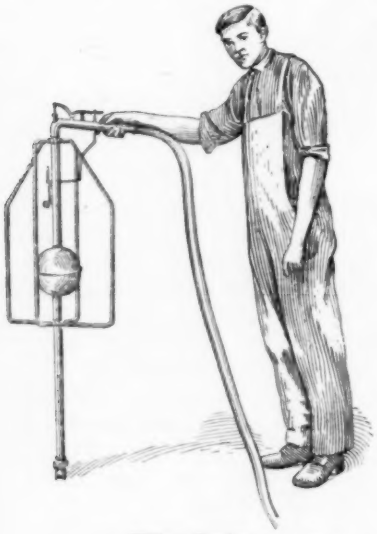


FIG. 5
Elemental Ice Apparatus

the fact that it can be worked only under very high pressures, varying from 900 lb. to 950 lb. per square inch, while sulphur-dioxide and ammonia work at very low pressures.



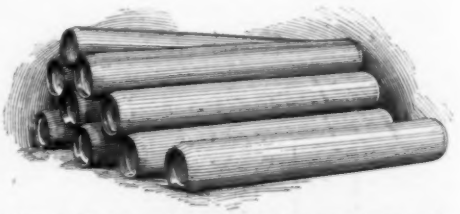
Filling Device

Ammonia is the gas most commonly used today as a refrigerating medium. It is cheap, easily compressed, and is easily deprived of any moisture, thus forming what is known as anhydrous ammonia. Ammonia is a gas made up of one atom of nitrogen and three atoms of hydrogen. It may be generated by heating animal products such as hair, horn, dung, hoofs, nails, etc. The common name for it, in fact, is "spirits of hartshorn," referring to the ancient mode of manufacture. Ammonia gas is a curious substance. Made up of two odorless gases, it nevertheless possesses one of the most powerful odors known to chemical science. The ammonia so commonly used in our households is simply an aqueous solution of the gas.

When the pure gas is compressed and cooled sufficiently, it becomes a liquid, and it is in this form that it is used as an ice-maker. When liquid ammonia is permitted to evaporate under ordinary atmospheric pressure, its temperature is 28.5 degrees below the Fahrenheit zero. If the pure, anhydrous, liquid ammonia is cooled to a temperature of 115 deg. F., it becomes solid, and, curiously enough, it loses almost all of its characteristic odor—one of the marvels of low temperature. At a temperature of 900 degrees F., ammonia gas breaks up into its constituents, nitrogen and hydrogen. The boiling point is about —28 deg. F., its specific gravity is about 5/8 of that of distilled water, and a gallon of it weighs 5.3 lb. Its latent heat of evaporation is about 530 thermal units at a temperature of 32 deg. F.

The ammonia used in ice-making is derived from ordinary soft coal. When soft coal is distilled, a very complex product is the result. Ammonia is one of the gases given off, and is taken up by water. The ammonia water thus formed is heated, and the gas driven off, rendered anhydrous, compressed into the form of a liquid, and is then driven into steel cylinders. These cylinders contain 100 lb. of pure anhydrous ammonia, and are never quite filled, in order that room may be allowed for the expansion of the liquid arising from variations in temperature.

The cylinders containing the ammonia are connected to long coils of iron pipe, and the gas allowed to escape into them, through a valve. Immediately, like a school boy let out for a recess from a pent-up school room, the liquid ammonia scampers through the pipes, rejoicing in its newly found but temporary liberty. The liquid speedily changes to the gaseous



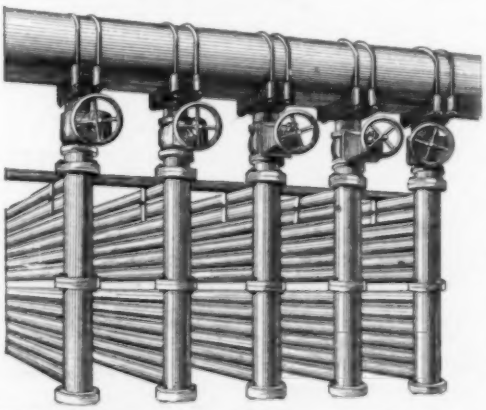
Steel Cylinders, Each Containing 100 Pounds of Pure, Liquid Ammonia

form; but, as has been demonstrated in the experiments described in the beginning of this article, such change of state demands heat, and the heat is

immediately taken from the iron coils. These expansion coils may be exposed to the open air, in what is known as the direct expansion system, circling a number of times about a room designed for cold storage purposes. If the object is the production of ice, the expansion coils are immersed in a heavy brine, into which are placed large oblong iron boxes, filled with water.

The expanding gas robs the coils of some of their heat; the coils in turn take heat from the brine; the brine takes it from the iron boxes; the iron boxes in turn absorb it from the water, and the water freezes.

Figure 5 will give one an idea of the arrangement, diagrammatically, of the different elements entering into the process. An apparatus of this kind, as shown in the figure, would be expensive in operation, as it does not provide for the saving of the ammonia gas. This gas costs about $200 per ton of ice making capacity. Accordingly the ammonia, after it has done its work, and is quite hot, is not allowed to escape, but by means of condenser pipes, over which large quantities of cold water are constantly flowing, is cooled, and then by means of powerful com-



The condenser which lowers the temperature of the compressed gas, to enable it to return to liquid form.

pressor pumps, caused to reassume the liquid form, and may be used over and over again, none of it being lost in the process.

The floor of an ice plant looks like an enormous checker-board. The squares are the wood covers of the iron tanks immersed in the brine. It takes about 48 hours to freeze the

The Finished Product

water thoroughly, and thus make a block of ice of the size and dimensions so familiar to the passers-by on the streets of our cities. The reason it takes such a long time to freeze is due to the fact that the ice forms first along the six sides of the container. This makes an insulating coat that hinders the absorption of the heat units from the interior of the ice box so formed.

A device, called a "filler," is used to place exactly the right amount of water in each tank. A float automatically shuts off the water supply by releasing a trigger when the tank has received its exact quota. The tanks are filled from the bottom upwards, an important matter, as it prevents the admission of air to the water. It is quite curious that air, although perfectly colorless itself, will make "milky" ice. The same phenomenon may be observed when the "white" of an egg is beaten briskly, or when the propeller of a steamship vigorously churns the water.

An ammonia compression plant consists of practically four parts: The

expansion coils, the compressor into which the gas is drawn and compressed, the condenser, which lowers the temperature of the compressed gas sufficiently to enable it to return to the liquid form, and the receiver where the liquid ammonia is stored until it is needed for another ice-making tour.

It requires 45 cylinders of ammonia of 100 lb. each to make 100 tons of ice. In many ice factories the water ordinarily is not pure enough, and a distilling plant is a necessary adjunct. As regards the quantity of pipe used in the best factories for condensation purposes, it requires about 320 ft. of 1½-in. pipe to the ton of the ice-making capacity. The brine is generally made from common salt, but calcium chloride forms a better brine that will not freeze, as occasionally happens in the case of salt brine.

OLD PAPER STEAMED FROM WALL

A wallpaper remover which steams the paper from the wall, taking off four or five layers as easily as one, and working almost as rapidly as the steaming-pan can be drawn over it, is here illustrated.

Steam Wallpaper Remover

Steam is generated in a few minutes by a heater placed in the center of the room, and is conveyed by a hose to the steaming-pan. Two of these pans are provided, one being as wide as the ordinary width of wallpaper, and the other for use in spaces of awkward size. Both are simply held against the wall and drawn down the strip of paper from coping to baseboard, the operator pulling the paper away from the wall as fast as the pan is drawn over it.

The greatest objection to wallpaper has always been that it is a germ trap if left on, and yet is very difficult to remove. In some cities laws have been enacted prohibiting repapering without first removing the old layers. This machine is said to remove the paper of a room of ordinary size in from one to two hours.

RADIO ACTIVITY IN AUSTRALIA

Radio-active mineral is being found in Australia, and efforts to provide for general medical use, free, when patients are unable to pay for the treatment, are being made by the government of New South Wales.

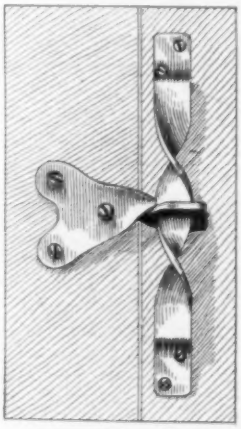
The last reports from the prospect in South Australia, near the New South Wales border, state that a shaft has been sunk 130 ft. and a large, strongly defined reef is showing. The black ore carries large patches of bright yellow carnotite, which is highly radio-active.

Medical authorities of Sidney have made an appeal for $10,000 to be used for the purchase of radium for the hospital, and considerable of the amount has already been subscribed. The radium so purchased will be devoted to treatment of persons of small means.

The most important step, however, is that taken by the government of South Wales, which proposes a state radium bank, such as is in operation in Paris and London. The scheme is to make the treatment of cancers, and other like diseases, by means of radium, available, not only to every hospital, but to every private practitioner in the state. The bank would hire the radium out to the private practitioners, while an ample supply would always be kept on hand for the use of any recognized public hospital for the free treatment of patients of small means.

HINGE THAT CLOSES DOOR

The spiral hinge here illustrated automatically closes the door, gate, or other object to which it is attached. The moment the door is swung open it starts to rise on the spiral, and, when let go, closes by force of gravity.



¶A manufacturer in New York has devised an electric clock with a phonograph attachment to be used for advertising purposes. The talking machine tells the story while pictures of the articles to be advertised are flashed on a transparency.

BIG TREE HURDLES FENCE

That a large pine tree could be broken off by the wind and blown over a fence without harming the latter seems extraordinary, but just such a curious freak of the wind is shown by this illustration. The tree stood close beside a high board fence, the top of which rises above the point where the tree was broken off. The force of the wind lifted the heavy trunk above the fence top and dropped it on the other side, the only damage to the fence occurring near the bottom, after the tree had struck the ground.

Extraordinary Freak of the Wind

MOTOR TRICYCLE GRINDSTONE

That keeping abreast of the times in all kinds of industry, even though it be of a very small and humble order, is worth while, is demonstrated by the success of this scissors' grinder. The motor tricycle, which, by the way, he made himself, carries him from place to place and also furnishes the power for his grinding apparatus.

An Up-to-Date Scissors Grinder

¶About 800 aeroplanes have been built in France, to date.

THE MAKING OF ARTS-CRAFTS LAMPS

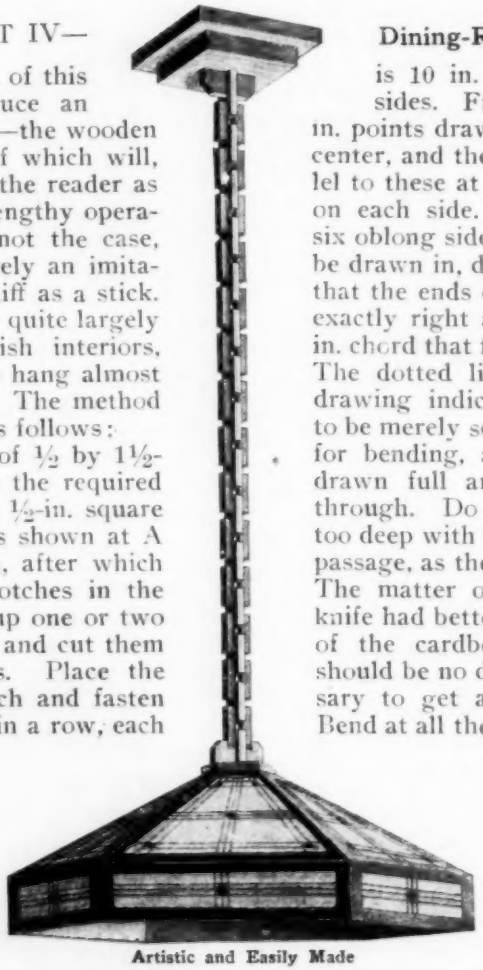
By JOHN D. ADAMS

PART IV—

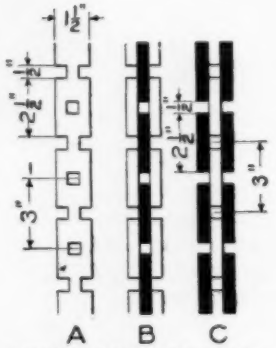
IN the construction of this dome, we introduce an entirely new feature—the wooden chain, the making of which will, at first sight, strike the reader as a very tedious and lengthy operation. But such is not the case, for our chain is merely an imitation one and is as stiff as a stick. Such chains are now quite largely used in mission-finish interiors, and may be used to hang almost any form of shade. The method of making them is as follows:

Plane up a strip of ½ by 1½-in. stuff, as long as the required chain, and then cut ½-in. square holes every 3 in., as shown at A in the detail sketch, after which cut ½-in. square notches in the sides. Next plane up one or two ½-in. square strips, and cut them into 2½-in. lengths. Place the strip A on the bench and fasten on the little blocks in a row, each block occupying the space between two square holes, as indicated at B, where the attached blocks are shown black. Now turn the strip over and attach a similar row of blocks on the other side, and our chain is complete. Use glue and two wire nails for each block.

For the shade, a piece of cardboard, measuring not less than 27 by 30 in., will be required. On this draw a circle of 11½-in. radius, and then step off six 10-in. chords around it—10 in. because our shade



Artistic and Easily Made

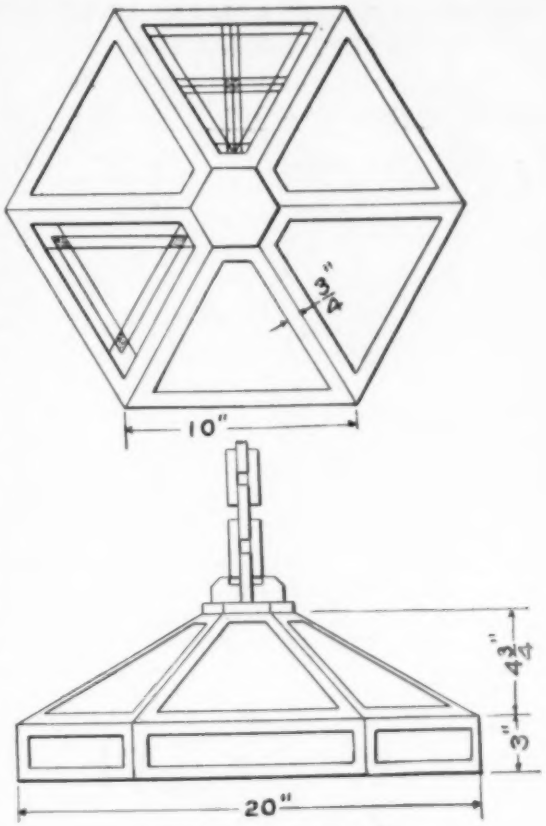


Detail of the Wooden Chain

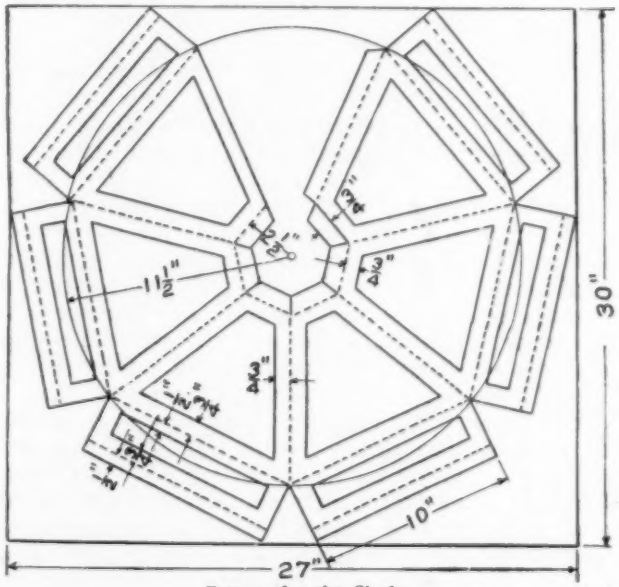
Dining-Room Dome

is 10 in. on each of its six sides. From each of the 10-in. points draw radial lines to the center, and then draw lines parallel to these at a distance of ¾ in. on each side. The lines of the six oblong side panels should now be drawn in, due care being taken that the ends of each panel are at exactly right angles with the 10-in. chord that forms its upper side. The dotted lines in the pattern drawing indicate those that are to be merely scored with the knife for bending, and those that are drawn full are to be cut clear through. Do not attempt to cut too deep with the knife at the first passage, as the hand is apt to slip. The matter of scoring with the knife had better be tried on a piece of the cardboard, as the mark should be no deeper than is necessary to get a good sharp bend. Bend at all the different places before joining the two ends. This bending is best done by placing the line of bend directly over the sharp edge of a table or board and holding the portion on the table down with the straightedge. Any rough or torn edges should be smeared with glue and sandpapered when dry. When all is ready, connect the first and last of the triangular faces with glue. If the cardboard is inclined to be porous, give all the joints a preliminary coat of glue to act as a filler. The shade having assumed its

dome shape, bend down the side panels and connect the adjoining edges of adjacent sections with passe-partout tape, which should also be applied to the connection already made. Go over the entire frame with the drop black. A hexagonal block is now to be prepared, and the six flaps at the top of the dome should be bent inward and fastened with glue and tacks to the under side of the hexagonal block. This completes the shade proper, with the exception of the colored paper triangular panels. If a leaded-glass effect is desired, select some simple design like that shown, and draw it out with the drop black, or still better, with aluminum paint. Among the better class of shades the grape design is often found, and if the reader is something of a water colorist, the decoration of this shade will afford an excellent opportunity for a little talent along that line. In any event use paper that comes in flat sheets, as rolled paper never can be made to look real flat unless it is dampened and placed in a letter press. The penetration of the light almost always exceeds one's expectations, which makes it advisable to experiment a little before attempting anything elaborate. After the proper color has been obtained, the intensity can be altered by adding one or more thicknesses of paper, or else by the addition of a sheet of heavy drawing paper. For ordinary purposes, a three-light outlet should be procured and fastened to the under side of the hexagonal block, the wires running up the angles of the wooden chain. This completes a very attractive lamp.



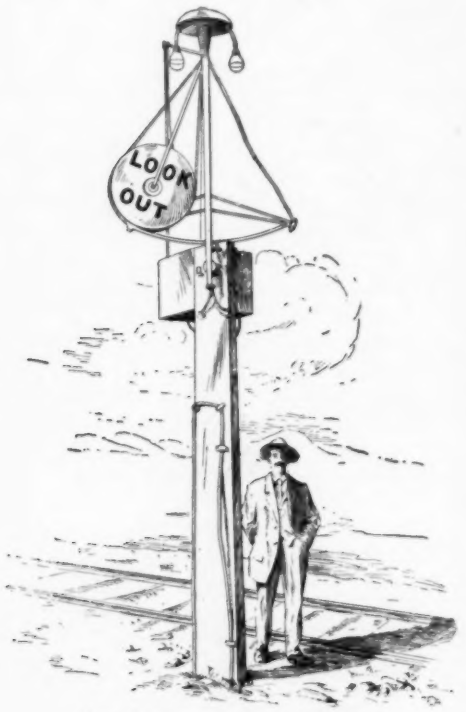
Detail of Frame for Shade



Pattern for the Shade

"AUTOMATIC FLAGMAN" FOR ELECTRIC RAILWAYS

"Automatic flagmen" are being installed on the lines of the Pacific Elec-



New Crossing Warning Apparatus

tric Railway Co., of Los Angeles, after a series of tests. The feature of the apparatus is a disk pendulum, which swings back and forth when a car approaches. The other warning instruments provided are a trolley-car bell and two electric lights.

About 1,500 ft. from the highway crossing thus protected, a number of 6-ft. sections of contact rails are bolted to the regular tracks. To these are connected starting relays in such manner that the tread of the wheels makes a contact as the car passes over, but there are no moving parts. The passing of a car over the contact-making device simply starts the mechanism actuating the pendulum and gong, which, being provided with a timing element, runs a given length of time before stopping, thus warning all who approach.

INDUSTRIAL PROSPECTS OF ST. HELENA

Lace making, the growing of a fiber like hemp, and mackerel curing are industries on which the island of St. Helena bases its hope of returning prosperity. Since the opening of the Suez canal little but lean, empty years have been felt by the people of the lone, forsaken island where the great Napoleon spent his declining years in captivity. That the island is not the barren rock it has been depicted, and that it is capable of large things commercially is the firm conviction of its governor general, Lieutenant Colonel Gallway, who recently made a visit to London for the double purpose of enjoying a brief rest after seven years' continuous service, and of interesting capitalists in the possibilities of his little province.

Situated about 1,000 miles off the west coast of Africa, removed from the present pathways of trade, the 47 square miles that include all the land surface of the island are covered with verdure and are susceptible of extensive cultivation. The growing of hemp fiber, destined to be used with the best of the Manila product in rope making, has been given much attention by the inhabitants, but capital is required to boom the industry to its fullest extent. The fiber is of good quality, Governor General Gallway states, and can be grown in abundance. Lace that compares favorably with the fabric of the well known European lace makers, is being made in small quantities by the islanders, the industry having been introduced during recent years, and bids fair to become one of the principal products of the island. Mackerel curing employs many of the male members of the population and this also, being in its infancy, has a rosy future, provided the all-needed capital can be supplied.

"Napoleonic traditions are rapidly disappearing from St. Helena," states Governor General Gallway. "There are still a few very old men who were babes at the time of Napoleon's death and who remember—very vaguely—their parents speaking about the famous pris-

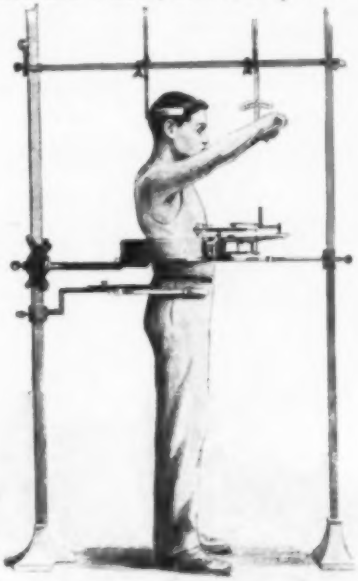
oner. They always refer to him as General Bonaparte. The present generation knows next to nothing of Napoleon the Great, but much more about Dinizulu and General Cronje, who were prisoners on the island, the former in 1890 and the latter in 1900."

MEASURING CHEST MOVEMENT DURING RESPIRATION

The thoracograph is an apparatus by which diagrams showing the movements of the chest during respiration may be obtained. All that is required is to start a clockwork-driven carriage running around the body of the patient, and a pantograph arrangement makes the diagram.

A copper ring, 18 in. in diameter, surrounding the chest of the subject, is the track upon which the carriage supporting the recording apparatus runs. During the revolution of the recording apparatus, a small ebonite wheel, attached to one end of the pantograph, is kept in contact with the chest, side or back by a spring. The other end of the pantograph carries a pen, the point of which rests on a sheet of cross-ruled paper on the top of an aluminum disk. This disk rotates with the same angular velocity with which the carriage moves around the ring, but in the opposite direction, these opposite rotations compensating each other, so that the lines ruled on the paper always remain parallel to their original direction. The pen, and the ebonite wheel which touches the skin of the subject, move radially, and the displacements of the pen are exactly half as large as those of the wheel. The pen, therefore, draws a complete contour of the horizontal section of the thorax of one-half the natural dimensions during the time it takes the carriage to travel completely around the ring.

The subject takes his place in the apparatus, the standards of which are provided with devices to keep him in a rigid position, the ring is set at the proper height, the ebonite wheel is placed in contact with his skin, and the clockwork is wound up. The subject then draws a long breath and holds it while the wheel, started by releasing



Making Diagrams of Respiratory Movement

a catch controlling the clockwork, travels completely around its ring-track. The operation is then repeated with the chest deflated, and the record is made. In the illustration of the diagram the dotted line shows the contour of the chest inflated, and the solid line shows it deflated.

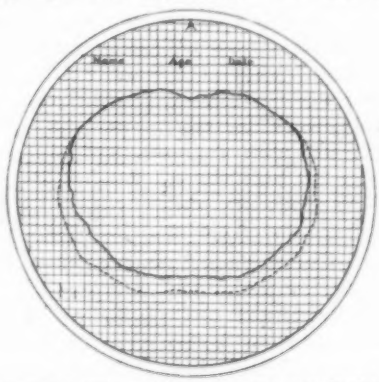
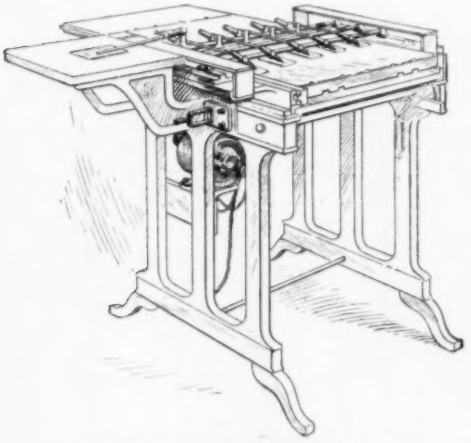


Diagram Showing Chest Inflated and Deflated

¶Servian merchants in Belgrade contemplate the establishment of an American commercial museum and show room in their city.

SIGNING CHECKS BY PANTOGRAPH

The average man, even in business, is not overburdened with physical labor due to the necessity of spending hours



The Making of One Signature Writes Twenty

in signing checks and bonds, but the heads of big organizations, such as corporations, must spend a large part of several days at certain periods writing their names over and over again. Consequently, to make this work of high officials less arduous, a pantograph machine by which the movement of writing one signature writes as many as 20 has been devised.

The user of the machine takes the "master pen" of the mechanism in his hand and goes through the motion of writing his signature. Attached to this pen is a light aluminum frame, moving almost without friction on roller bearings, secured to which are from 10 to 20 pens, at measured distances apart. Every motion of the master pen is thus exactly duplicated by each of the pens attached to the frame. These pens are of the fountain type.

In signing checks, time is still further saved by making the writing surface a magazine of checks, and by placing it on rollers. The rolling table thus formed has receptacles for four piles of sheets, each sheet containing five checks. A motor underneath the table, controlled by pushing a button, and a spring arrangement, are utilized for working the piles of sheets into proper position for signature.

SOURCE OF WIRELESS WAVES SHOWN BY NEW COMPASS

Italian scientists have invented a curious compass, actuated by Hertzian waves, by which the captain of a ship provided with it can determine, rapidly and simply, the direction of the station sending forth a message.

Until this instrument appeared there was no way by which the officers of one ship could tell the location of another ship sending out signals, unless the distress messages gave longitude and latitude, or by which the captain could find out by wireless the exact position of his ship when approaching harbor in a fog. Had such an instrument been in service when the transatlantic liner "Republic" met with disaster, the vessels answering the wireless calls for help could have steamed rapidly to the exact spot instead of having to search for hours in the dense fog.

In operation, the indicator of the

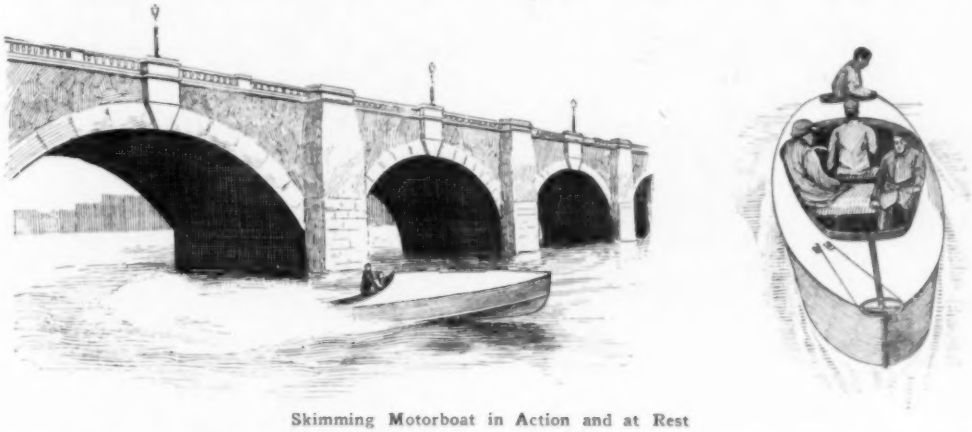
Compass that Responds to Wireless Waves

compass points directly to the source from which the wireless message is sent, so that, if the signals are kept up, all that is necessary is to steer the

searching ship in the direction to which the indicator points.

SKIMMING MOTORBOAT MAKES 40 MILES AN HOUR

Although only 26 ft. long, this curious motorboat is equipped with an engine developing 120 hp., and can attain a speed of slightly more than 40 miles an hour. The reason of this great speed is the shape of the hull, which gives her an action like that of a hydroplane, although having no plane, she cannot be called one.



Skimming Motorboat in Action and at Rest

When not running, the queer craft looks very much like an ordinary motorboat, but at full speed the greater part of the forward end rises out of the water, and she is supported by a short strip nearly amidship and possibly by another area near the stern. The inventor, however, believes that at some speeds the contact at the stern is almost negligible, just steadying instead of supporting her. Between these areas of contact, the lines of the hull are made very hollow. At full speed the water does not touch the bottom in the hollow, evidence of which fact is positively provided by means of a hole. At high speeds this hole is unplugged, and no water comes in, although it can be seen, apparently an inch or so below the boat, flying backward at 40 miles an hour.

Almost all high-speed motorboats are wet. That is, considerable water comes aboard, but this boat is dry, the reason lying in the use of sharp angles instead of round surfaces. The water is thrown directly away from the hull instead of following it around. At the highest speed, two huge volumes of water are thrown to each side.

Unlike the regulation hydroplane, this type of boat is quite seaworthy, combining and even adding to the speed of the former with the staunchness of the latter.

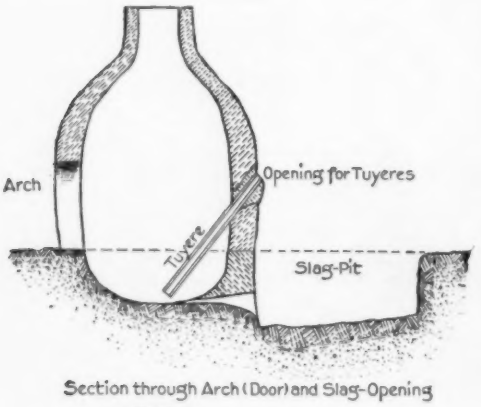
UNITED STATES HAS LARGEST REFRACTING TELESCOPE

The great refracting telescope erected in the open air at the Treptow observatory, near Berlin, to popularize the science of the heavens, is claimed to be the largest refracting telescope in the world, but this is a mistake. The largest is the magnificent equatorial refractor of the Yerkes Observatory, near Lake Geneva, Wis., although its length is only 62 ft., while that of the German instrument is 70 ft. The lens of the Yerkes telescope, however, is 40 in. in diameter, as compared to the 27-in. diameter of the German lens. The diameter of the glass or mirror is the deciding factor in estimating the size of a telescope.

¶Owing to the excessive humidity on the Canal Zone, good housekeepers burn an incandescent lamp inside their pianos at all times to prevent the wires from rusting.

NATIVE IRON SMELTING IN GUINEA

An English mining engineer, while traveling in Upper Guinea, West Africa, found in a small village called Bobela three native iron furnaces of a type never before recorded. Two of the furnaces were in operation, and one was cold, the iron having been removed and lying outside. Further on, between the Niger and Senegal basins, hundreds of slag heaps and abandoned furnaces were found, dotted over the country in all sorts of positions, some beside villages, and many in remote parts of the bush, but none of them in operation. Inquiry among white people in the locality discovered no one who had ever seen one of the furnaces actually at work.



Native African Furnace—Sectional Plan Showing Arrangement of Tuyeres

Because the method of iron smelting adopted by these natives is one of which no record appears to exist, and because it differs radically from any other native method, a description of the furnace and its operation is of considerable interest.

The furnaces, according to a paper presented before the British Institution of Mining and Metallurgy by J. Morrow Campbell, are circular in section, about 5 ft. in external and 3 ft. 6 in. in internal diameter. The earth is scooped out of the inner circle to form a hollow hearth about 18 in. deep in the center. A narrow trench leads from this into a slag pit. The walls are built of stiff, wet, yellow clay, and are from 9 in. to 1 ft. thick at the base, diminishing to about 6 in. or less at the top. When the walls have reached a height of 18 in., about a dozen irregular elliptical holes about 1 ft. long by over 6 in. high are left at frequent intervals. A number of open pipes or tuyeres, made of a mixture of sand and clay and thoroughly dried in the sun, are inserted in these holes, some of the furnaces having as many as 26 of them.

In operation, combustible matter is placed on the hearth, and upon this, charcoal. The archway shown on the opposite side from the slag pit in one of the drawings is then built up with clay and stones, and the slag trench blocked. The next move is to fill the furnace to the top with a mixture of iron ore and charcoal, after which the charge is fired by the introduction of live charcoal through the tuyeres. Air passes down the tuyeres, and the products of combustion escape from the top of the furnace. Slag is drawn off from time to time as may be necessary. In six or eight hours the charge has run down, and then the furnace is again filled to the top with a mixture of ore and charcoal, and the process is repeated through the total run of about 30 hours.

At the end of the run, all slag is drawn off, the archway is broken down, and the mass of reduced iron, amounting to from 200 to 300 lb. in weight, is dragged out of the aperture and cooled with water. It is a spongy mass of steely iron, including considerable quantities of slag and charcoal. It is never really molten, having only reached a pasty condition in the furnace. The furnace serves for several

runs, but new tuyeres have to be inserted at the commencement of each run.

It seems extraordinary to the engineer who studied the furnaces that such structures, under 6 ft. high, could reach a sufficiently high temperature for the smelting of iron without artificial blast. On consideration, however, he finds it not quite so surprising, as the air supply, before it reaches the point where the oxygen enters combustion, is at a high temperature, owing to its having passed through red-hot tuyeres, thus providing a crude but effective form of hot blast.

PISTON-OPERATED VACUUM CLEANER

A small vacuum cleaner, operated with a piston, like a bicycle or bilge pump, has been placed on the market by a British firm. One of the features of the apparatus is that no energy is wasted, dust being extracted on both the up and down stroke of the piston. The small size of the apparatus and its low price, are also important features. The simplest way of working the machine is to hold the handle still against the body, and to move the tube quickly backwards and forwards over the surface.

TELEPHONE CONNECTION FOR OFFICIAL CARS

The moment one of the private cars of officials of the Lehigh Valley system comes to a stop on a siding or in a yard for a more or less prolonged period, the crew removes a long pole from its place underneath the car and hooks it to the nearest railway telephone line. This pole, with its reel of wire, makes a telephone connection between the car and the railway system so that the officials can transact business without the necessity of leaving their traveling offices. The Lehigh Valley system is said to

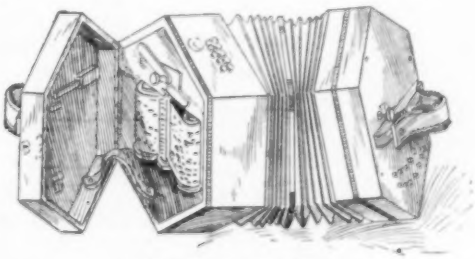
Official Car with Telephone Connection

be the first to equip its officials' cars in this manner.

SELF-PLAYING ACCORDEON

The piano-player has become an accepted innovation, and is now so common as to call forth little comment, but the adaptation of the self-playing principle to accordeons seems rather "freakish." It has been done, however, and the concern turning out the machines is finding sales.

It is suggested that the instrument, in the possession of a blind or otherwise physically incapacitated person, would

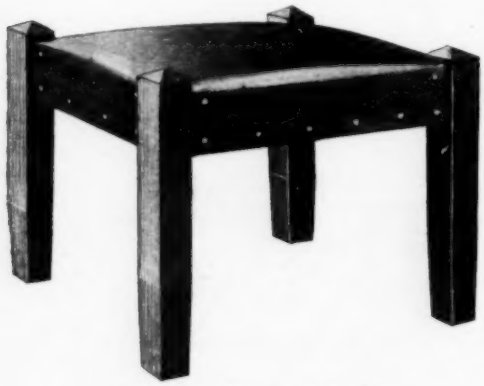


Automatic Accordeon

bring in more nickels and pennies from a street crowd than the same kind of instrument indifferently played by hand.

A MISSION FOOT-STOOL

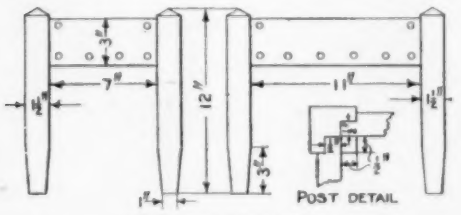
The illustration shows a very handy foot-stool in mission style. The following list of materials will be needed:



Mission Foot-Stool Complete

4 oak posts, 1½ by 1½ by 12 in., S-4-S.
2 sides, ¾ by 3 by 12 in., soft wood.
2 ends, ¾ by 3 by 8 in., soft wood.
1 bottom, ¾ by 8 by 12 in., soft wood.
1 small box of 8 oz. tacks.
2½ doz. ornamental head nails.
1 piece of dark leather, 16 by 20 in.
½ lb. hair and a small portion of mission stain.

The posts are the only parts made of quarter-sawed oak, the other parts, being covered with leather, can be made of any kind of soft wood. Chamfer the top end of each post, and taper the lower ends as shown in detail. When this is done the mortises can be cut for the sides as shown in the post detail. When cutting the mortises and tenons take care to make them fit perfectly, as there is nothing to brace the legs at the bottom. The strength of the stool depends upon the joints. Make the surface of the posts smooth by first using No. 1 sandpaper, then finishing with No. 00.



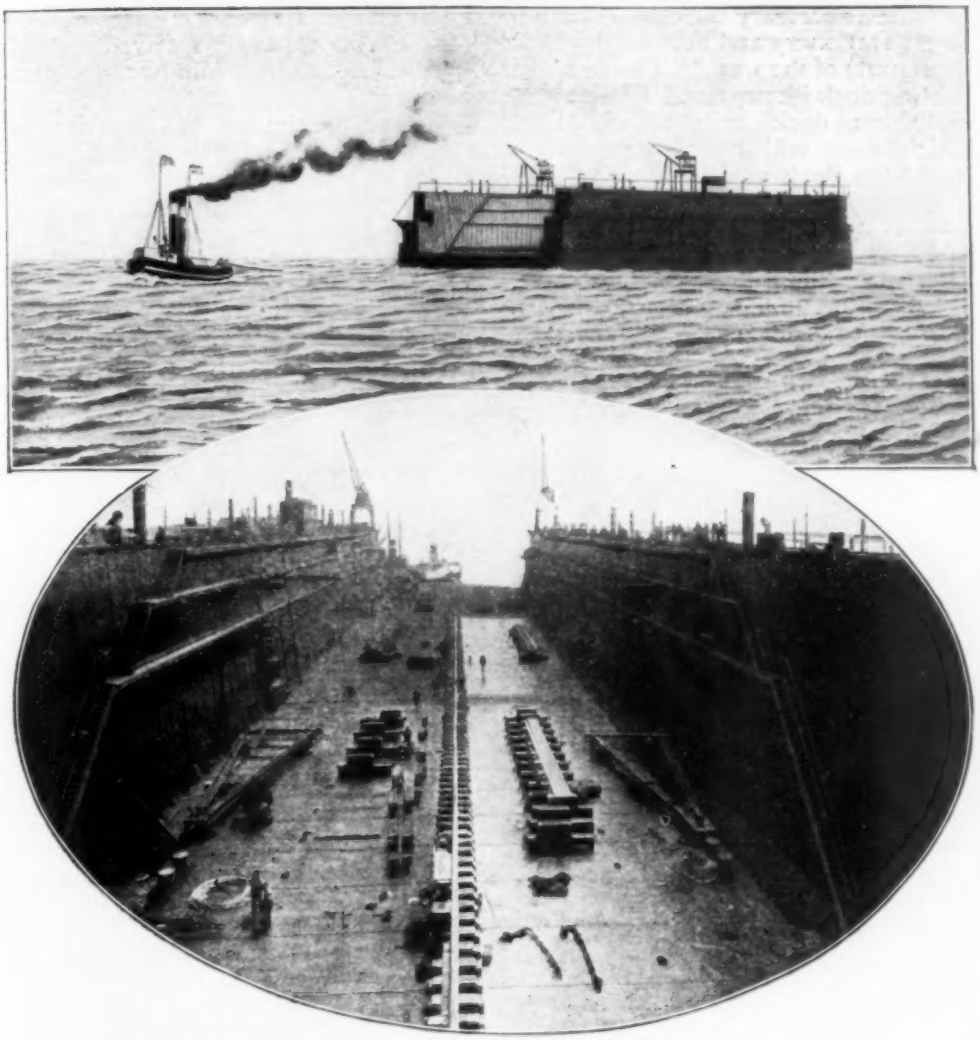
Details of Foot-Stool

The parts are now assembled. First clamp the ends together, using plenty of glue on the joints, and drive some small nails on the inside of the posts through the tenon ends. When the glue has set, the remaining sides can be put together the same as the ends. Fit the bottom on the inside about 1 in. from the top. This can be made fast by driving nails through the sides and ends of the board. The finishing is done by putting on the mission stain as the directions state on the can, then wax the surface to get a dull gloss.

The leather is now put on. Notch out the corners to fit around the posts, but do not cut the ends off. Lap them under the cover. Before nailing on the cover fix the hair evenly over the top, about 6 in. deep. Draw the leather over the hair and fasten the edges with the 8-oz. tacks. The ornamental nails are driven in last, as shown in the drawing, to make a good appearance.

PUBLIC HYGIENE TAUGHT AT FIVE-CENT SHOWS

The moving picture theater as a valuable medium of publicity is now recognized throughout the country. Organizations and institutions engaged in hygienic and sanitary reforms are spending much money for the production of films and slides to show the disastrous effects of certain agencies for the spread of infectious diseases. The first instance of the adoption of the motion pictures for use in a purely local crusade occurred in Buffalo, N. Y., when the commissioner of health secured the co-operation of several five-cent theaters in his campaign against an epidemic of whooping cough. In this connection, pictures were not used but, between films, slides were placed before the audiences which called attention to the prevalence of the disease and requested co-operation in combating it. Brief directions as to treatment and preventive measures were given. A feature of the work was the hearty co-operation with the city authorities by the proprietors of the theaters.



Starting Out to Sea—Interior of 22,000-Ton Floating Dock

BRAZIL'S 22,000-TON FLOATING DRYDOCK

The great 22,000-ton floating drydock, recently completed in England and started across the ocean to Rio de Janeiro, gives Brazil one of the first docks of this type especially constructed for the accommodation of "Dreadnoughts," three of which type of battleships, said to be as powerful as any in the world yet built, were ordered by this South American republic.

The great dock is capable of lifting and carrying a vessel of a displacement of 19,250 tons. Its length is 550 ft. over all, and its width 136 ft. It consists of a pontoon, or lifting portion, provided with two parallel side walls. The illustrations show the dock being towed out to sea on its long journey across the Atlantic, and a view of the interior lengthwise.

The advent of the Dreadnought and Super-Dreadnought types of battleship

has made necessary the construction of larger stationary and floating drydocks in all parts of the world. The Brazilian floating dock is surpassed in size by the 35,000-ton dock built at Hamburg, which soon will be surpassed by a 40,000-ton dock now building at Kiel.

STREAM OF WATER CONDUCTS ELECTRICITY

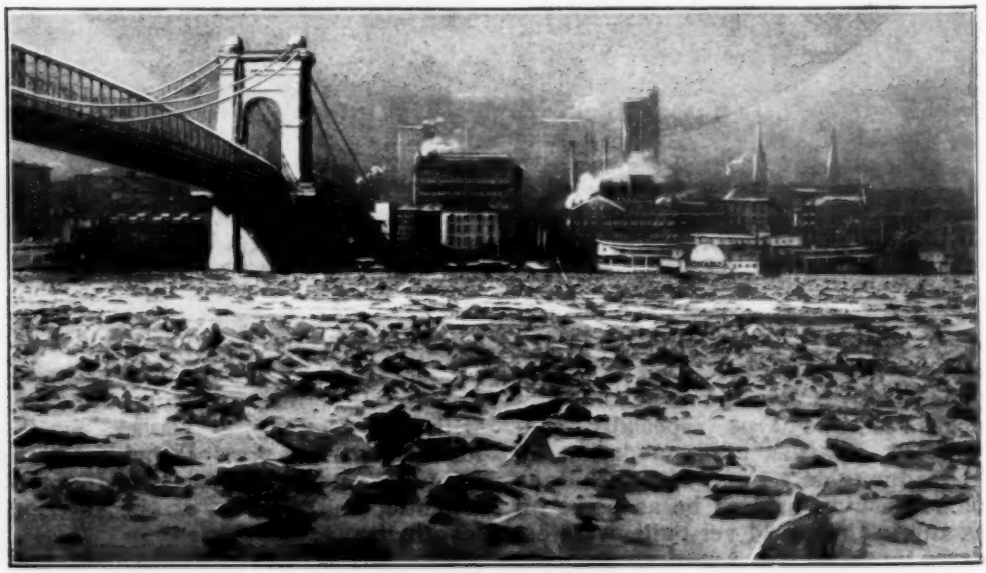
A Chicago fireman recently had an interesting experience with a stream of water and an electrically-charged rail. Standing on the water-soaked wooden planking of an elevated railway structure, he was directing a stream of water against a fire enveloping the 600-volt third rail. While the stream was being played upon it, he felt no shock, but just as the stream fell short of the rail following the order to shut off the water he received a shock which almost threw him from the platform.

During the time he was directing the stream on the rail, the platform on which he was standing was doubtlessly charged with electricity from the damaged insulators supporting the third rail, but it is believed that the small current which flowed over the moving stream and the hose to the ground kept the nozzle at a potential so near to that of the charged platform that he felt nothing. When the connection through the stream was interrupted, however, he received the full effect of the difference in potential between the charged planking on which he was standing and the ground provided by the water in the hose line.

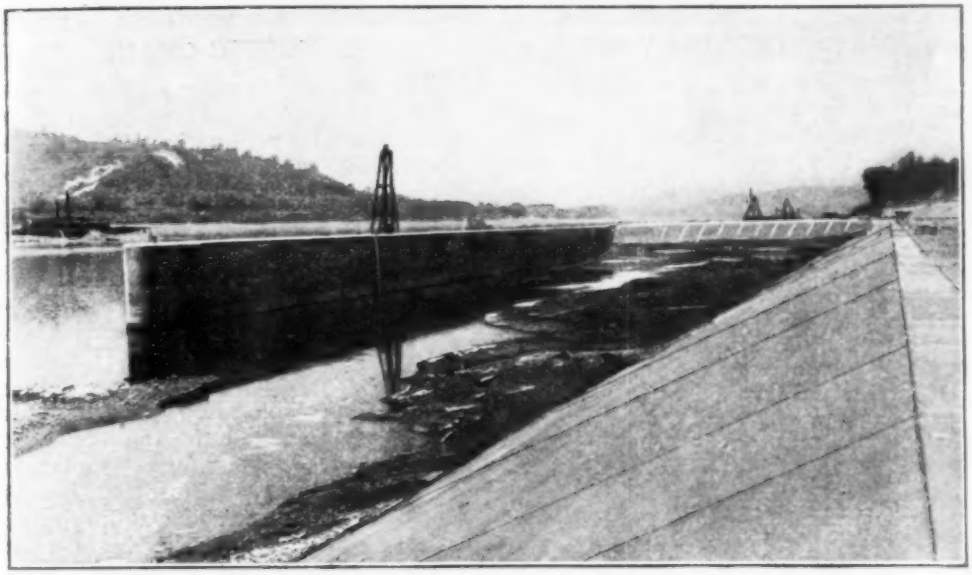
ICE HARBOR IN OHIO RIVER TO PROTECT CRAFT

In connection with the million-dollar dam that has been constructed in the Ohio river, 12 miles below Cincinnati, the United States government has built an ice harbor in which the river craft may take refuge in the winter and early spring from the masses of floating ice that has caused millions of dollars worth of damage in past years.

The harbor is solid concrete, re-inforced with steel, and is the first to be built in the Ohio. It is large enough to afford ample protection against ice runs to all the craft in its vicinity. It



Ice Gorge in the Ohio River at Cincinnati—These Conditions Have Caused Much Damage in the Past



The New Ice Harbor Built by the Federal Government—Vessels May Take Refuge in the Inclosure

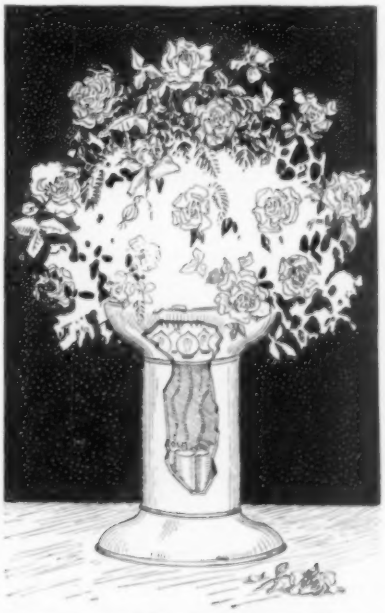
has happened frequently that the entire river would be filled in the early spring with huge cakes of floating ice that crush and grind even vessels of the largest type.

In the summer, the new harbor can be used as a repair dock. It is stated that similar structures will be provided at the other dams to be built in the Ohio.

ILLUMINATED FLOWER CLUSTERS

The tungsten filament has made possible new and artistic electric table-lighting effects without the necessity of running wires up under the table or dropping them from the ceiling to provide the current. Instead, the new table pieces are self-contained, being provided with a single-storage cell capable of supplying current for three tugnsten lamps for 14 hours.

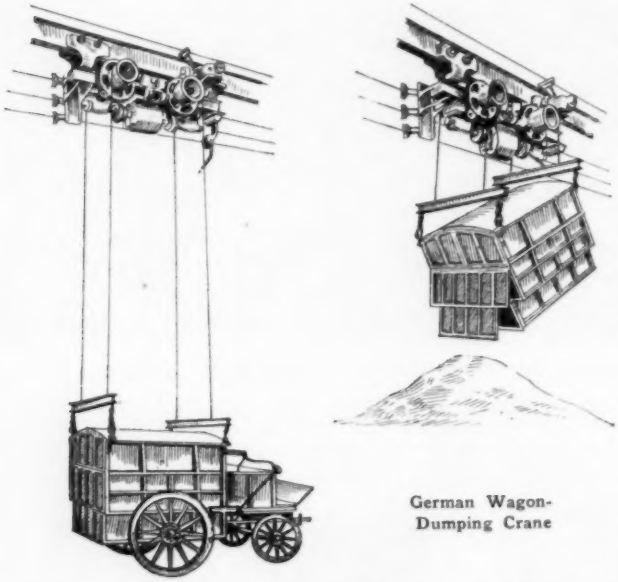
The table piece shown in the illustration consists of a silver receptacle containing the storage cell and three tungsten lamps, over the top of which is set a shallow glass dish containing water and cut flowers. The flowers are held in position by a glass disk provided with perforations through which the stems are inserted. The illumination, passing through the glass and water, and diffusing itself around the flowers and leaves, produces a beautiful effect.



Illuminated Flowers for Dinner Table

OXY-ACETYLENE TORCH CUTS WAY THROUGH VAULT

An oxy-acetylene torch was used recently to cut away a section of the wall of a bank vault in Springfield, Mass. The vault armor consisted of 60-lb. rails, dovetailed into each other, and bars of three-ply chrome steel between the rails, the whole being set in cement. The total cutting was 30 ft., and the thickness of the wall was 5½ ft. The cement between the rails complicated the work, and it was necessary to chip it away as the cutting progressed.



German Wagon-Dumping Crane

¶After careful investigation of the subject the experts of the Department of Agriculture at Washington state that rubber cannot be produced in commercial quantities in the United States proper. Great progress is being made with the industry in the Philippine Islands, however, where it was taken up but a few years ago.

¶The atmospheric conditions in the Argentine Republic are so favorable for wireless telegraphy that the postmaster general of that country proposes its substitution for the present telegraph system.

UNLOADING REFUSE WITH ELECTRIC CRANE

The refuse-gathering wagons of one of the German cities are designed to be unloaded by electric cranes. The bodies are made detachable from the four-wheeled trucks, have a swinging or drop door at the back, and are provided with strong eye-bolts for the attachment of the pairs of hooks suspended from an electric traveling crane. The two pairs of hooks and lifting cables are operated by the one motor, but the forward cables are wound on a larger drum than those attached to the rear of the wagon, so that the front of the wagon rises faster than the rear.

TELEPHONE LINES FOR FREIGHT TRAINS

The telephone as a means of transmitting orders from the rear ends of long freight trains to the locomotives drawing them was recently given a test on an exceptionally long coal train. The train in question was composed of 123 cars loaded with coal. It was drawn by two locomotives from the Indiana coal fields to Mattoon, Ill., the movement of the train being directed by telephonic orders given by the conductor in the caboose at the rear. The wires were strung over the cars from the caboose to the locomotives.

OHIO TOWN HAS UNIQUE PUBLIC COMPANY

The little town of Loveland, Ohio, with a population of about 3,000, is successfully operating a system of public utilities that might well make a city, several times its size, proud. Loveland is situated on the Little Miami River, 23 miles from Cincinnati, and its public service company runs a combination

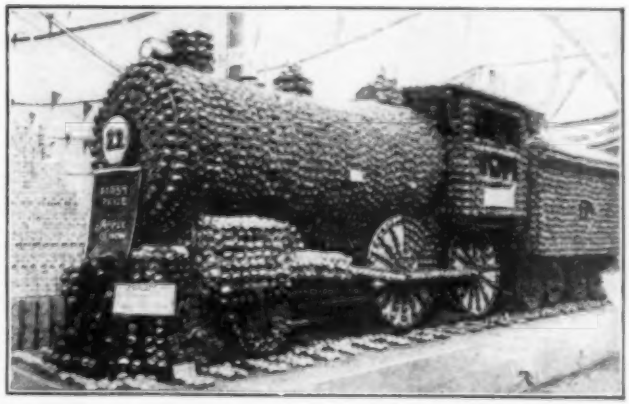
electric power and light, water and ice plant. The four enterprises are conducted by one chief officer with a single force of assistants, and it is the economical combination of the three that makes each a success.

The water is obtained from a deep well on an island 2,600 ft. from the station, and is conveyed to a storage tank of 45,000-gal. capacity, located under the large pumps at the station. Every user of steam engines in Loveland has been induced to adopt electric power, and an all-day and all-night electric service is provided. The ice plant, which uses power from the power plant, thus rendering both economical in the running, takes care of approximately 20,000 cu. ft. of refrigeration, besides manufacturing 15 tons of ice daily. The success of the ice plant is mainly due to the storage of large quantities of ice. Thus it can be operated continuously instead of only a few days at a time or a few hours each day. Over the ice storage rooms proper are rooms for the storage of fruit, meat, eggs and other perishable goods.

LOCOMOTIVE BUILT OF APPLES

The prize-winning exhibit at a horticultural exposition recently held at Sebastopol, Cal., was the apple locomotive here illustrated. Standing on an apple track, which in turn rested on apple ties, the unique locomotive, made of several thousand specially selected apples, was easily the most popular set-piece provided for the entertainment of the spectators.

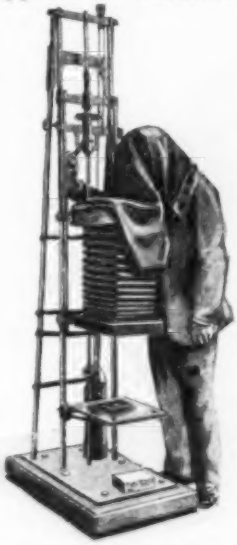
The framework holding the apples was 26 ft. long and 9 ft. high. Very few details were omitted, the completed piece including the cow-catcher, headlight, stack, bell, whistle, sand-chamber, cab, tender, etc.



An Edible Locomotive

VERTICAL PHOTOGRAPHIC APPARATUS

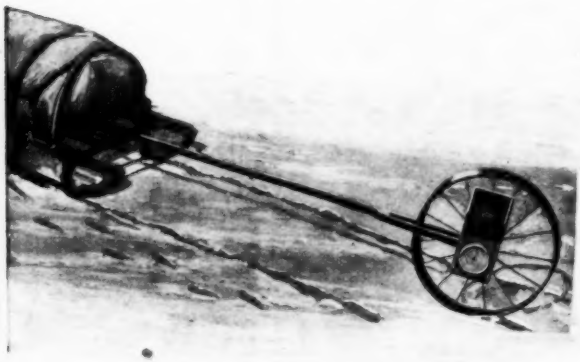
Included among the new photographic apparatus installed in the French School of Mines, Paris, is a vertical camera for the convenient reproduction of both transparent and opaque objects. The camera is fastened to two vertical rods sliding on two fixed posts, and is balanced by a counterpoise attached to a cord passing over a pulley. Object holder is adjustably attached to the posts and focusing is effected by moving either camera or holder.



Vertical Camera Used in French School of Mines

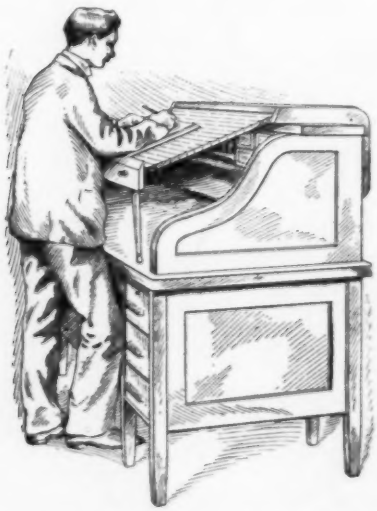
ROLL-TOP DESK CONVERTED INTO STANDING DESK

An attachment designed for converting a roll-top desk into a combined office and bookkeeper's desk is here illustrated. It also gives additional working space when the main writing surface is covered up with documents.



A Polar Speedometer

The attachment consists of a casing secured to the top of the roll-top desk and provided with a flexible leaf, which may be pulled out in front to form a rigid writing surface at the height of the ordinary standing desk.



Extra Writing Surface Attachment for Ordinary Desk

SPEEDOMETERS WILL RECORD DASH TO SOUTH POLE

Captain Scott's dash to the South Pole is to be the first polar expedition in which the actual distance of the journey traveled by the sledges will be measured by mechanical means. Only a couple of weeks before the sailing of the "Terra Nova," Captain Scott decided that mileage recorders, especially constructed for polar conditions, could be used to considerable advantage.

Consequently, the recorder here illustrated was devised. The recording meter is attached to a trailer wheel, which is lashed to the back of the sledge. The wheel is provided with short spikes, and all the metal parts are of aluminum. Seven of the instruments were taken by the expedition.

CLAM-GATHERING WITH MOTORBOATS.

Scattered along the Mississippi River and its many tributaries are hundreds of river dwellers who make a comfortable living gathering clams, and lead a care-free, easy-going life. Their regular income is derived from the sale of shells to button factories, the price received being from $15 to $20 a ton. Then there is also the possibility of finding valuable pearls, which lends fascination to the work.

The usual method of gathering the clams is dragging grapnels along the bottom of the river from a motor scow. This motor-driven scow is about 20 ft. long, and 4 ft. wide. Uprights at each side and end support the gas piping to which the grapnels are fastened. The grapnels, made of wire, are hung three or four in a string at intervals about 4 in. apart on the pipe or piece of tubing.

When the desired spot is reached,

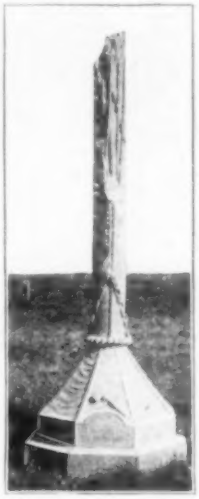
one of the pipes, with its battery of grapnels, is dropped overboard and allowed to drag behind for about ten minutes. The boat is then stopped, the catch hauled in, and the second outfit dropped overboard. The grapnels, dragging along the bottom in water anywhere from 6 to 12 ft. deep, strike the clams, which close their shells upon the wire and hang on with a tenacious grip. Less than 40 clams at a haul is considered a small catch.

After the catch, the clams, which are usually larger than the palm of the hand, are dumped into zinc-lined wooden boxes built over brick fireplaces at the edge of the river bank, and steamed. This steaming makes the opening and cleaning of the shells simple. The meat is thrown into a box, where it undergoes a thorough sorting and squeezing in the search for pearls. Nearly all the pearls are marketable, and some have even been worth several hundred dollars.

On the stretch of water known as Peoria Lake, a wide part of the Illinois River, about 18 miles long, the clamming fleet includes more than 150 motor-propelled craft.

CIRCUS MEN'S MEMORIAL TELLS THE STORY

While a large circus was exhibiting at Wahpeton, North Dakota, lightning struck and shattered one of the tent poles, killing two of the employes. They were buried in the Wahpeton cemetery, and over them was erected a monument representing a shattered tent pole.

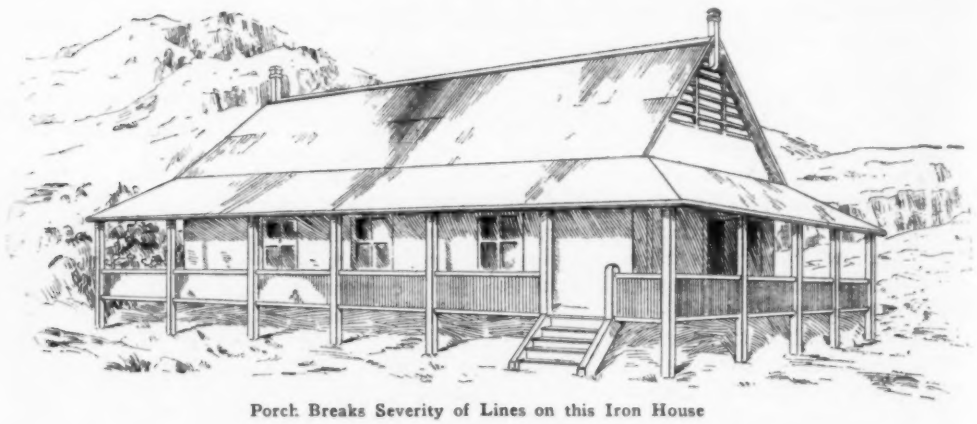


¶The Mutes' World's Convention at Colorado Springs authorized the creation of a fund to provide educational and religious instruction and entertainment by printing lectures by eminent men on moving-picture films and sending them around among the deaf mutes of the country.

ARTISTIC PORTABLE METAL HOUSES

The first portable metal houses placed on the market were mere boxes, provided with a gabled roof and partitioned into stall-like rooms. Such houses, as hideous in appearance as an ordinary shed, have now given way to the demand for more artistic and pretentious designs, and as a result it is

A Handsome Metal House



Porch Breaks Severity of Lines on this Iron House

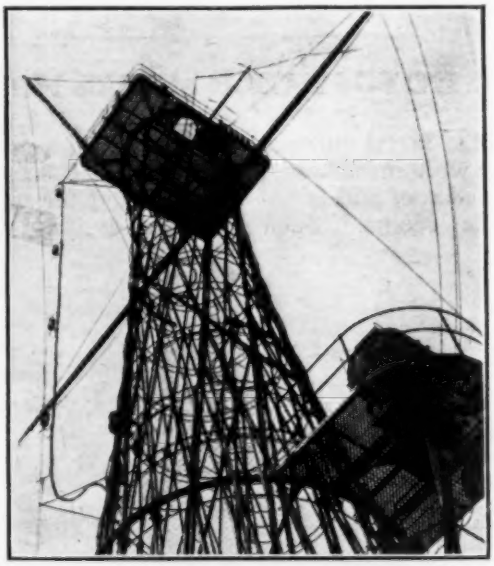
now possible to purchase a metal house of considerable architectural merit as well as features of convenience.

The two houses here illustrated are fair examples, the box effect being broken by well proportioned porches.

SIGNALING DEVICES ON U. S. BATTLESHIPS

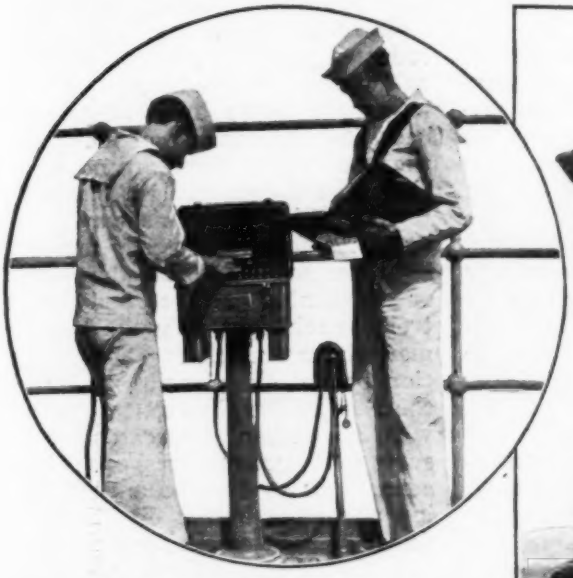
By WALDON FAWCETT

The whole current history of the United States navy shows a continual quest for new equipment designed to promote in one way or another the efficiency of our floating fortresses. In no sphere, however, has study and experiment brought a higher degree of perfection than in the facilities for signaling. Under present conditions when our battleships operate almost wholly in fleet formation, it is more essential than ever before that each ship shall be enabled to communicate promptly and accurately with the flagship or any other vessel in the division or fleet, or with the shore. With the twentieth century precautions against all contingencies in time of battle, it is the aim to provide enough and diversified systems of signaling so that if one or two be put out of commission, there will yet remain others to make communication by day or night possible.



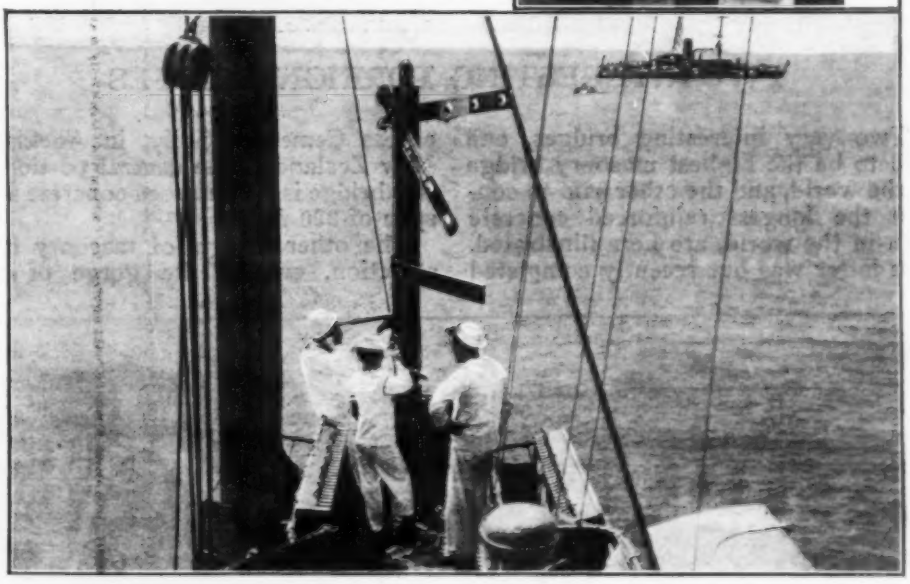
ARDOIS SIGNALS SUSPENDED FROM MAST
Controlled and manipulated by means of a keyboard located on the bridge of the battleship. This keyboard is operated much after the fashion of a typewriter keyboard.

The wireless telegraph has paved the way for a new era in communication between warships at sea, although, unfortunately, the wireless telephone has not yet been perfected sufficiently to fulfill all naval needs. For daylight signaling on the warships, there is yet



Operating the Ardois System of Signaling

New Device for Controlling Searchlight Signals



Semaphore Signaling on U. S. S. "Minnesota"

extensive dependency upon the manipulation of signal flags from the truck and the familiar "wig-wag" signaling by means of small flags waved by hand. Both of these are, of course, daylight systems but the "wig-wag" system may be converted to a night system by the substitution of an "electric torch" for the small signal flag.

The main dependency for night signaling, however, falls upon the Ardois system which consists of a cluster of red and white lights (incandescent lamps) the various combinations of

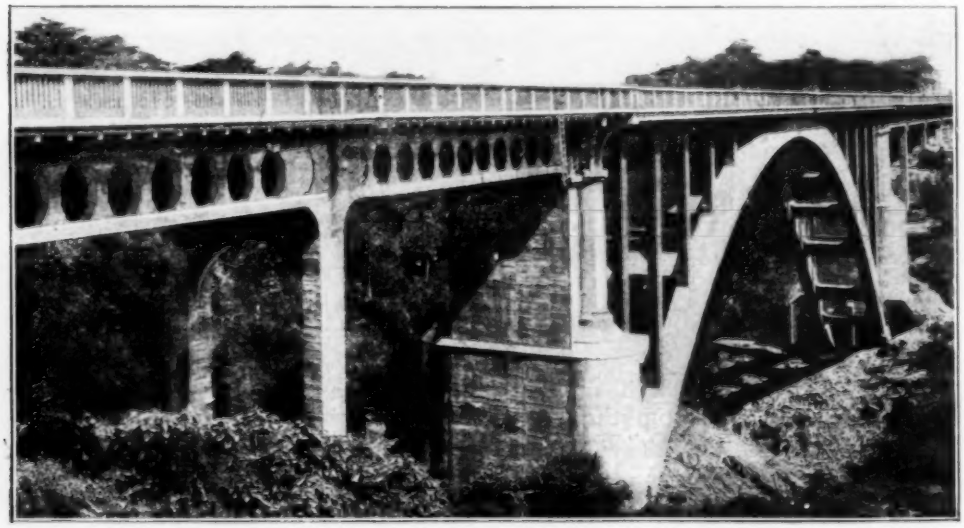
which, signifying the respective figures and letters of the alphabet, are controlled and manipulated with almost incredible rapidity by means of a keyboard located on the bridge of the battleship and operated much after the fashion of a typewriter keyboard. The semaphore system is available for use both during the day and at night. The wooden arms, which by their different positions convey word by word any signal message are, of course, readily discernable during the daylight hours and at night they are outlined in electric lights which render them no less conspicuous.

One of the newest "wrinkles" in our navy is the increasing use of the powerful searchlights for signaling purposes, particularly in time of fog. The searchlights are employed for signaling not only at night but in the daytime as well, and they have conveyed messages a distance of more than eight miles. In order to promote the searchlight signaling, the old-time method of manipulating the lights by hand power has been entirely done away with. Under the new regime there are no men stationed on the searchlight platforms to turn the big lights this way and that by sheer force. Instead, the searchlights are now manipulated by electrical or mechanical means, and the control of each light is in the hands of a man who can remain in a sheltered position behind the conning tower or at the base of the fire control tower and who has at hand apparatus which insures the prompt response by the searchlight to every command involving a change in the direction of the finger of light or the formulation of a new signaling combination.

TWO INTERESTING FOREIGN BRIDGES

Two very interesting bridges, one said to be the highest masonry bridge in the world, and the other said to contain the longest reinforced concrete arch in the world, are here illustrated. The latter was but recently completed across Cemetery Gully, in Auckland, New Zealand. The central portion of this bridge is a reinforced concrete arch span of 320 ft.

The other bridge, of masonry construction, crosses the gorge of the



Long Concrete Arch Span in Auckland

High Masonry Bridge While in Course of Construction

Rhumel River at Constantine, Algeria. The viaduct is 1,475 ft. long, and has 27 arches of unequal dimensions. The arch shown in the illustration is the largest of these, 230 ft., and crosses the gorge 330 ft. above the bed of the river.

The Aviator

By CHARLTON L. EDHOLM

HE ranges new dominions
On silken, sun-kissed wings,
The flutt'ring engine sings;
He mounts on tireless pinions.

From cloud to cloud ascending
He soars in golden light,
While yet below is night,
A night that seems unending.

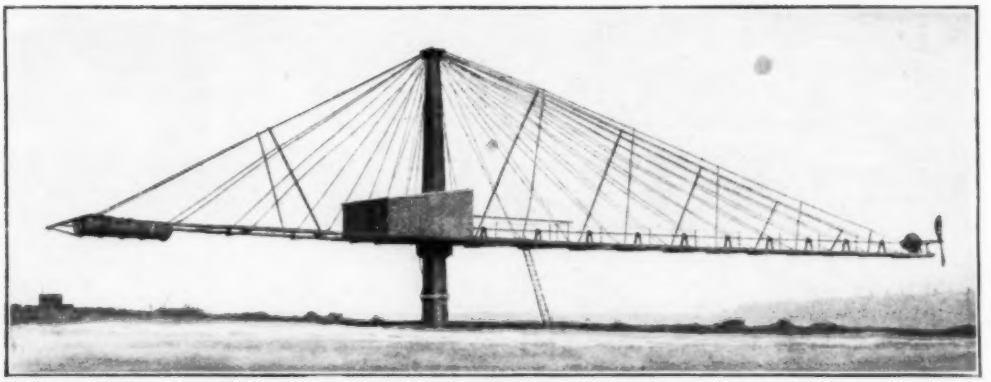
Upon the wings of morning
He sees on twilit earth
Afar the New Day's birth,
Its promise and its warning.

The dove o'er floods returning
Was watched, as we watch now,
For spray of olive bough;
Hark, all mankind is yearning:

"What bring you, navigator,
From shoreless seas of air,
What token do you bear,
What message, aviator?

"Bright wings, come you with blessing
Or fraught with death and woe,
The harried race below
With new, red fears oppressing?"

No answer. Just the singing
Of engines. That is all.
While earth-bound gropers call,
Dumb Fate o'erhead goes winging.



Tests the Power of Airship Propellers

AIR PROPELLER TESTING PLANT

By JOHN R. MAIDENS

Elaborate machinery has been installed at the Vickers' Sons and Maxim's Works, Barrow-in-Furness, England, for testing the efficiency of airship and aeroplane propellers. The apparatus consists of a steel cantilever, accurately balanced and suspended in such a manner that it is free to revolve on the head of a cast-iron column.

The point to which the suspension rods converge is a steel bracket to which is fastened a steel tube. At the head of this tube there is a ball bearing which supports the entire weight of the moving portion of the structure. The arm proper is built up of steel angles, and is provided with a covered observation station at the center, which contains a 100-hp. motor and the recording instruments. Although this motor is nominally 100 hp., it is capable of testing propellers absorbing up to 200 hp.

At the extreme end of the arm, and 110 ft. from the center, there is a steel platform carrying the bracket and bevel gearing for driving the propeller, the power being transmitted along the arm by steel shafting. The other end of the arm terminates in a sheet-iron ballast tank by means of which it is possible to accurately balance the whole structure.

When conducting trials, the revolutions of the propeller may be varied from 250 to over 1,000 revolutions per minute.

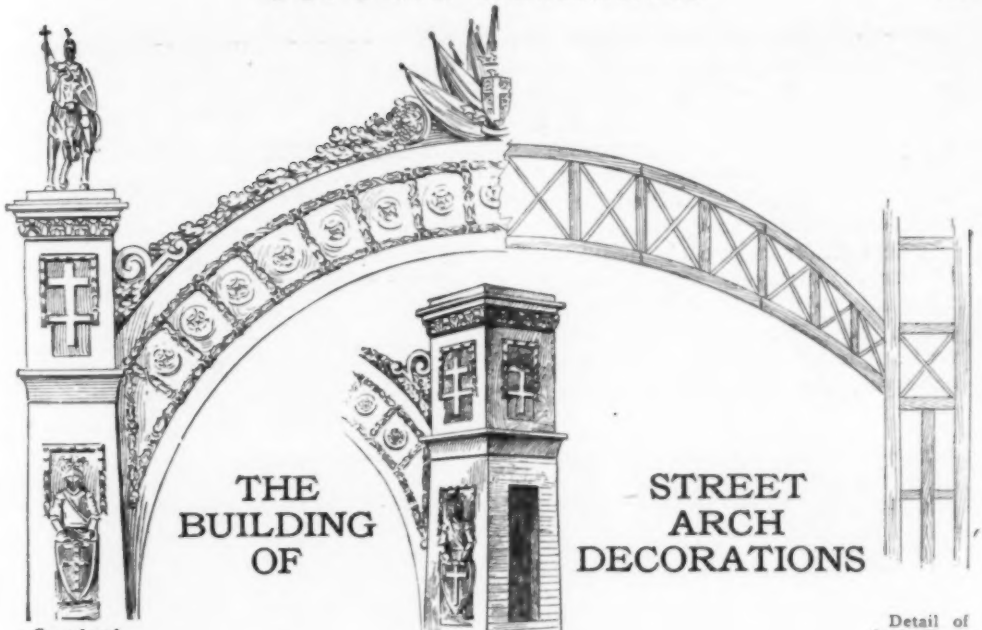
LARGEST, FASTEST, MOST POWERFUL CRUISER

The British armored cruiser "Lion," just launched, is the fastest, largest, and most powerful cruiser in the world. Her length is 700 ft., her beam, 86½ ft., and her displacement, 26,350 tons, which is greater than that of the two great battleships to be added to the American navy.

Regardless of her huge bulk, the "Lion" will have the extraordinary speed of at least 32¼ miles an hour. Her main armament will consist of eight 13½-in. guns, and the armor, which will extend from the upper deck to well below the water-line, will be 10 in. thick.

Although the "Lion" has the cruiser shape, even the British naval writers smile at the idea of calling her a cruiser. She has the armor and armament of the battleship class.

¶The Exchange Bankers' Association of the Far East is waging a campaign against the use of the typewriter for filling in particulars on bills of exchange. The association wants all such writing done by hand to avoid forgery.

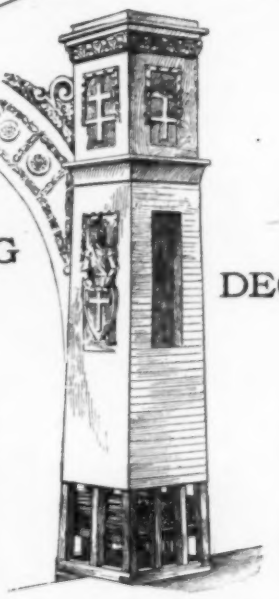


THE BUILDING OF STREET ARCH DECORATIONS

Completed Arch

Detail of Arch Frame

Street arches are becoming more popular every year in the decoration of cities on occasions of civic fêtes and general celebrations. These arches are not difficult to construct, are comparatively inexpensive, and form imposing and handsome temporary ornaments.



Base of Timbers and Ballast Platform

A quick and inexpensive method of erecting arches was used in Chicago during the Knights Templar conclave. Owing to the fact that the asphalt street paving was laid on a solid concrete sub-base, the structure could not be fastened to the ground. Each column had to be constructed in such a manner that it would support its part of the weight without being fastened with guys or anchored to the ground.

The columns were built up on a base, made of 10 by 12-in. timbers, on which 6 by 8-in. uprights were set to carry the arched framework.

A platform was built, about one foot up from the base, inside of the uprights, and on this ballast was placed to hold the entire arch solid. The ballast consisted of six tons or more of pig iron. Sand in bags would do as well, however. No bracing was required to keep the arches rigid.

In the illustration of the column, the different stages of construction are shown. The uprights were covered with sheathing, and cloth was tacked on the boards to make a smooth, white surface. Openings were left in the woodwork to make recesses for ornaments.

The arch proper consisted of two girders, made of narrow boards, latticed and braced sufficiently to carry the weight. In the second illustration, one-half of the arch is shown completed, while the latticed girders are uncovered in the other half. Boards covered the latticed work, and cloth, tacked on the boards, made the finish the same as the columns. The cloth was painted or sprayed with a plaster composition to give the whole structure the appearance of having been made of stone or plaster.

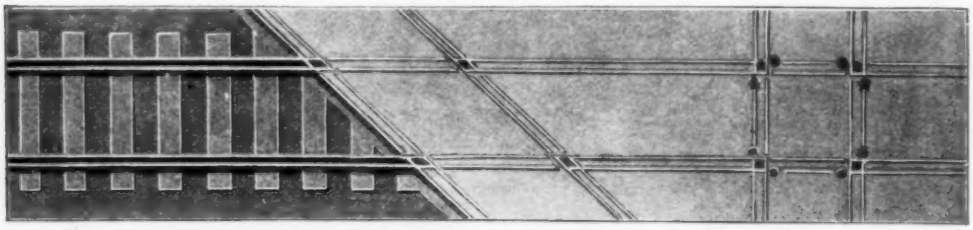
Ornamental designs were made up of plaster parts, modeled over hay and wire mesh, and attached to a light

frame of metal. The larger ornaments, such as a horseman, which were modeled by a sculptor, were built up in parts so they could be put in place piece by piece. After the parts were all in position, the joints were filled with plaster and smoothed so seams could not be detected.

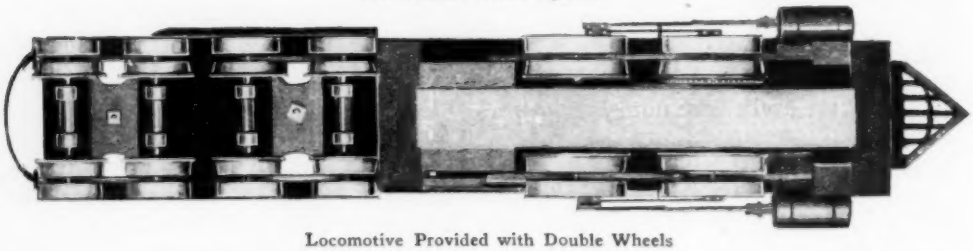
The timbers can be joined together by various methods, but as such structures are only temporary, it is best to use a joint that is quickly assembled without much work, and one that will not spoil the material for other purposes.

DAILY MOVEMENT OF THE EIFFEL TOWER

To ascertain whether the Eiffel Tower had suffered any displacement as the result of the Seine flood, an examination was ordered. It revealed the fact that the position of the top of the lightning rod, in relation to a datum, had not undergone any variation since previous examinations in 1896 and 1908, but that this point had a daily motion of from 1¼ to 7 in., varying in direction with the season and produced by the heat of the sun. It was east to west in May and August, 1896, north to south in December 1908, and east to west in June 1910. During winter, the sun only strikes the southern side of the tower while in summer it strikes all sides, producing a displacement in a general direction perpendicular to the meridian, and more complicated than during the spring and fall.



The Double Track System



Locomotive Provided with Double Wheels

DOUBLE-WHEEL SYSTEM FOR RAILWAYS

The long list of accidents, due to spreading rails and breaking wheel flanges on both electric and steam railways in this country, constitutes the reason for the new idea in railroad construction shown in the accompanying illustrations. First cost of such installation would, of course, be very large, as the system consists of double rails and double wheels.

The double-rail system consists of an ordinary standard gauge set of tracks, reinforced by a wider auxiliary track running just outside. The flanged wheels of the steam locomotive, electric car or passenger coach, would engage with the inner tracks, and the special flangeless wheels would engage with the auxiliary track.

¶Clement J. Driscoll, Commissioner of Weights and Measures of New York, declares that the citizens of New York City are robbed of $30,000,000 annually through short measure.

SHOP NOTES

Home-Made Air-Hose Connection

Those who have used compressed air on pneumatic tools will appreciate the air-hose connection shown in the illustration. The ordinary method of connecting an air hose to a pneumatic hammer or other appliance of this kind very easily loosens it from the socket by the moving of the hammer and the force of the air. In Fig. 1 is shown the ordinary connection where A is the hose; B, the grooved connection and C, the threaded end to which the hammer is fastened. Wire is wound around the hose at C.

The home-made connection is shown in Fig. 2. I used a ¼-in. nipple, A, and cut nicks on the outside, about ½ in. apart, then forced it into the hose. The nicks hold the nipple from coming out. I slit a ¾-in. nipple, C, in two and placed the two halves on the ¾-in. hose, one-half on each side. Then I cut one arm from a ¾-in. tee, B, and

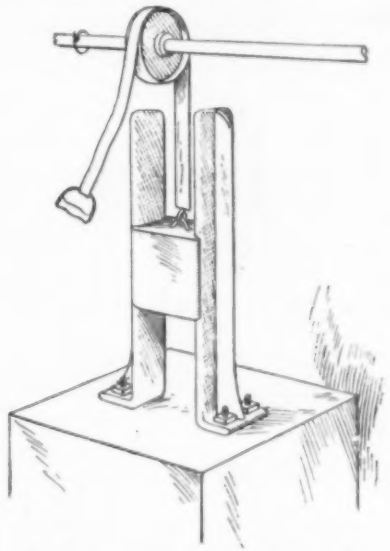
Fig. 1 Fig. 2

Connections for Air Hose

screwed it over the two halves on the hose, compressing the hose the thickness of the nipple slit, which forced the inside against the nicked part of the ¼-in. nipple and prevented it from coming out.—Contributed by Philip J. Conley, Chicago, Ill..

A Light Power Hammer

The accompanying sketch shows the construction of a power hammer for use in small shops, where the cost of an expensive machine is prohibitive. The guide and hammer are specially constructed parts. A little pull on the belt will cause enough friction to carry the hammer to the top of the guides. When released, the hammer will strike a blow proportional to its weight and

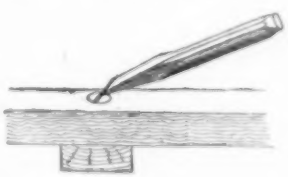


Friction of Belt Draws Hammer Up

height of drop. Different dies may be bolted to the anvil to make parts that will answer, in many ways, the same purpose as drop forgings.—Contributed by Urban A. Towle, Portland, Me.

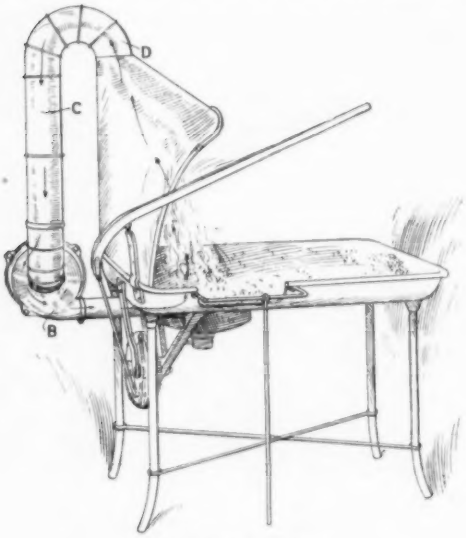
Turning a Rusty Screw

In turning a rusty wood screw, the head often becomes damaged so that the screwdriver will slip. This trouble may be overcome by putting the point of a chisel in the groove to one side of the center, as shown in the illustration, driving the chisel with a hammer and following around as the screw turns.—Contributed by W. C. Parker, Kanawha, Ia.



Burning Smoke from a Forge

Coal smoke is nothing else than unburned carbon. When great clouds of smoke go up from a forge, heat is wasted. I hit upon an idea to prevent



Smoke-Burning Forge

this waste and worked it out, as shown in the sketch, successfully.

Using a common forge with hood attached, I connected at D a tin pipe of the same size as the opening into the suction side of the blower, as shown at C. When the blower is in use, the smoke that rises from the fire passes in the direction of the arrows back through the blower and up to the fire without escaping into the open. By using this method, I have been able to get much more heat out of a given quantity of coal.—Contributed by J. N. Bagley, Webber, Kansas.

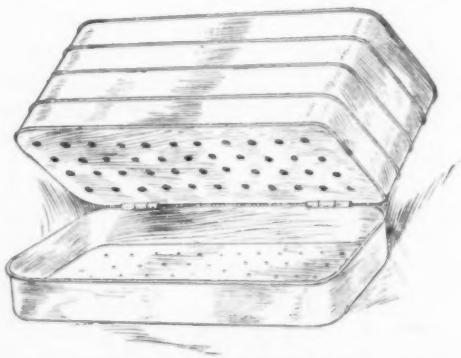
Oak Finish on Hard Pine

Owing to the scarcity and high price of oak for inside woodwork, many of the builders of moderate priced small houses are utilizing hard pine for their finishing material by using various shades of stains. This is the proper way to have a beautiful finish on hard pine and at the same time imitate oak. The proportions for the stain are: 1 part pure asphaltum; 2 parts linseed oil, 1 part turpentine. To each gallon of this, add from ¼ to ½ lb. of drop black and from ¼ to ½ oz. of burnt sienna, according to the shade desired. After thoroughly sanding, apply with a large brush and wipe dry within one minute. Allow this to stand two days.

Give the surface a coat of golden shellac cut in alcohol, to which has been added enough bismark brown to slightly color. Sandpaper and give the first coat of varnish, thinned slightly in turpentine. After from 24 to 48 hours, apply a second coat just as the varnish comes from the can. This will produce a very desirable finish much in favor.—Contributed by E. C. Andrus, Columbus, O.

Sorting Steel Balls

A number of small tin boxes having hinged covers with the cover of one box soldered to the bottom of another and each division drilled with holes of the same size, makes a convenient apparatus to quickly sort steel balls. Beginning at the top, holes which will allow all sizes of the balls except the largest ones to pass through them are drilled in the bottom of the first box; in the bottom of the next box, holes of such size that only the next smaller balls will be detained therein, and so on until



Compartments for Different Sized Balls

you have provided a box for each of the usual sizes of balls.

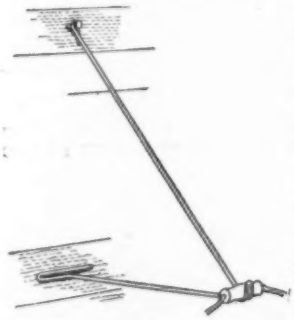
After cleaning the balls, all sizes are placed in the top box and the whole

combination shaken up. The balls will pass from box to box until they reach one with holes too small for them to pass through.

As the cover of each box is free to open, the right sized balls can be taken out without disturbing the others.—Contributed by C. G. Smith, Brooklyn, New York.

A Dairy Pail Hanger

The accompanying illustration shows a method of bending a wire so that when it is hung on a nail a pail may be suspended from the hook, keeping it clear from the wall. The bending of the wire is so clearly shown that the hanger needs no further explanation. The long bend resting against the wall at the bottom keeps the hanger from swinging around under the weight of a full pail. The base of the wire is 8 in. long and the upper part 16 in. Contributed by John A. Long, Walkerton, Canada.



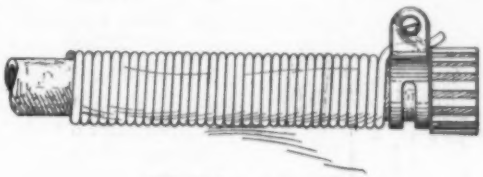
How to Draw a Wavy Line

When it is desired to draw a wavy line with the ruling pen, simply substitute the edge of a coarse-toothed comb for the straightedge. The more rapidly the pen is drawn past the teeth, the less wavy will the line be. Use a coarse comb in which the teeth are not too flexible.—Contributed by A. J. Augustine, Muskegon, Mich.

¶Should the paint on the rim of an automobile wheel be knocked off in places in removing the tire, take time to apply a good enamel to prevent the forming of rust.

Preventing Breaks in Garden Hose

Breaks in garden hose near the coupling can be prevented by removing

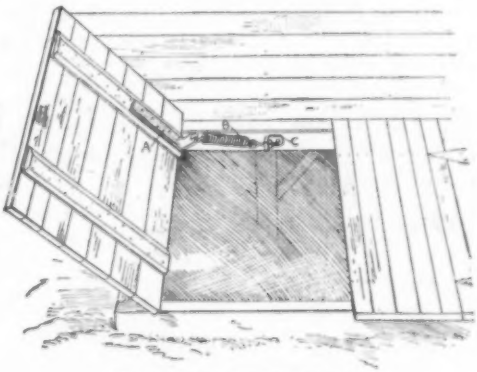


Coil Spring on a Hose

the hose and slipping a coil spring about 8 or 10 in. long over it, as shown in the illustration. The spring should fit the hose neatly. After replacing the coupling, the spring may be fastened to the band around the hose as shown.—Contributed by E. Maurice Dunivant, Fort Worth, Texas.

Counterbalance for a Cellar Door

The accompanying illustration shows a device attached to a cellar door to assist in lifting it, as well as to keep it from falling and breaking the hinges. A piece of heavy iron, A, is bent into the shape of an L and bolted to the door. The short end of A, which is 5 or 6 in. long, is attached to a coil spring, B. The other end of the spring is fastened to an L-shaped piece, C, on the joist, by a long threaded eye-bolt

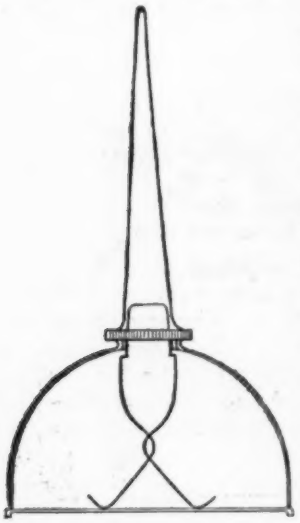


Cellar Door Counterbalance

for regulating the tension. This arrangement does away with the rope and pulley above the door.—Contributed by C. H. Floyd, Elwood, Ind.

Oil Can Bottom Spring

When the spring bottom in an oil can gives out, do not throw it away. Take a piece of brass spring wire, bend it as shown in the sketch, being careful to cut it to the proper length, and place it in the can. The pressure of the spring will keep the bottom out in the original position. The spring can be made in a few minutes and will save the price of a new oil can.—Contributed by C. T. Stendahl, Center City, Minn.



Paint-Brush Drainer

In the illustration, Fig. 1 shows a paint pot with a paint-brush drainer attachment. The attachment is made as shown in Fig. 2 from a 1-in. strip of metal. The diameter of the band should be ½ in. less than the pail. Hooks are attached to the band for holding it in position on the top edge of the paint pot. The outside of the paste, glue or paint pots will always remain clean, if this attachment is used. When the brush is drawn over the band, the surplus liquid drains down into the pot instead of on the outside of the pail.—Contributed by W. A. Jaquythe, Richmond, Cal.

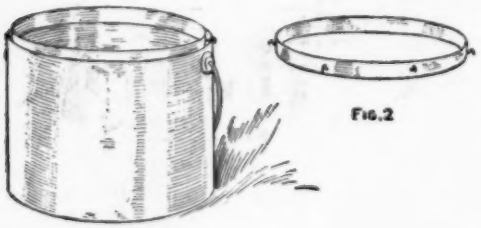


FIG. 1

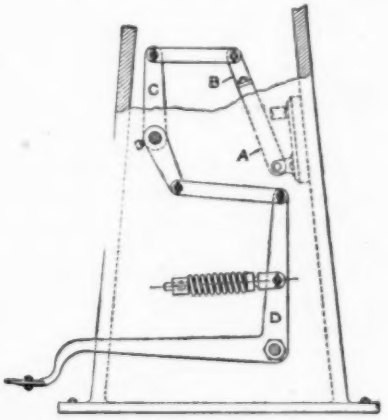
FIG. 2

Ring Drains Paint in the Pail

Emery Wheel Switch

It is well known that an emery wheel requires a considerable amount of power when running, even though no grinding is being done. It is also true in most shops that the men who use the wheel are very careless about shutting off the power when they are through using it. In order to prevent this waste of power a treadle device for throwing the switch can be used, as shown in the accompanying sketch, says the Railway Age Gazette.

The original switch A, has an extension B, bolted on, and this, through the two connections and the lever C, is connected with the upper arm of the lever D. This lever is pivoted at its lower extremity on a fixed shaft and has a bell-crank extension, at the end of which there is a treadle. Midway up this lever D, there is a helical spring which bears against a stop on the machine. When the machine is to be used, the operator puts his foot on the treadle and by pressing it down, throws the switch in and closes the motor circuit. He holds his foot on the treadle while he is at work, and when he lifts it to go away the spring throws out the switch and the wheel stops.



Switch Worked by a Foot Lever

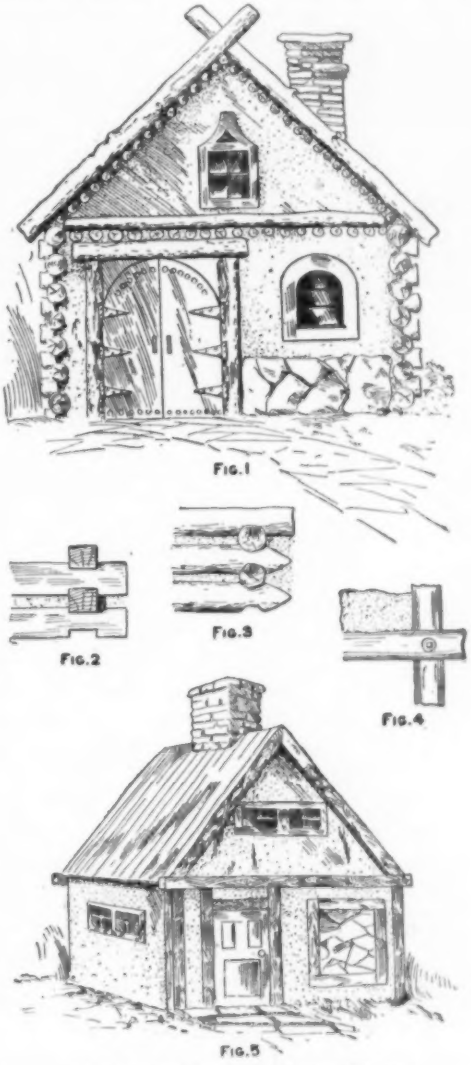
the mixed cement is packed in between shaped at the joints and the logs of

Concrete Log Houses

Since the application of cement to so many kinds of structural work, there have been numerous designs created in connection with log houses. The development of the cement industry has enabled architects to form designs of modern log residences for the country, the beaches, the city estate or wherever required, says Rock Products. Some of the designs of logs in combination with concrete effects are exceedingly attractive in appearance. Stone or pebbles for the rubble surfaces are used with good effect, while other types are executed with imitations of the natural materials in cement. There are cottages designed with the rubble surfaces set off with broken bottle green glass. Some good effects have been secured with hard wood set in blocks, angles, sections, curves and the like in the cement walls of the log frame cabins. There are other patterns possible; parts of frames, turns, etc., are utilized in conjunction with the rubble, cement and log work. Furthermore, models of attractive combination log and cement houses are made by introducing novelties in window sash, frames of heavy doors, metal doors, sheet iron or tile smokestacks, novel shaped windows, projecting ends of logs at the corners and kindred combinations.

One form of a log house is illustrated in Fig. 1. The house is built with log sides, and the front and back with cement covering on the log base. The sides can be filled in with cement, too, if desired, so that the log work only shows at the edges. Or, instead of having a smooth front, made with the cement packed in between the logs, the cement packing may be used for filling purposes only. This filling need not extend so deeply as to entirely cover the lines of the logs. The log surfaces will then show, resulting in a novel exterior for the building. The detail of putting up the logs is shown in the sketches in order.

The manner of uniting the edges of the logs, when it is desired to have the ends square, is shown in Fig. 2. The



Combination Log and Cement Houses

ends are simply chipped down to the square form required, and then the logs of one series are cut out so as to admit of the jointing with the logs of the other, as shown in the sketch. After the jointing work is completed,

If, instead, it is specified that these outside. Two spools of narrow tape

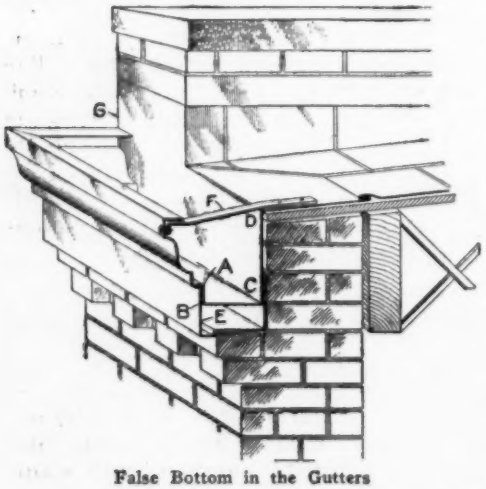
the mixed cement is packed in between the logs and permitted to set, resulting in a very firm and tight wall, if the work is correctly done. The cement, sand and water should be properly mixed and put in order for use. The cement, when too wet, cannot be properly packed. Again, if the mixture be too dry, proper packing will be equally difficult. Only when the mixture is of the right consistency, can it be placed securely in position and allowed to dry out. Such a concrete wall will last indefinitely.

A mode of effecting the corner connection, when the logs of one series are to be round, is shown in Fig. 3. The logs of one series are cut out oval-shaped at the joints and the logs of the opposite series are placed as shown. Then follows the concrete packing as before. Sometimes a joint is made with a bolt passing through the two logs at the terminal, as in Fig. 4.

A building erected with logs planed and their ends squared is shown in Fig. 5. This building is intended for service in parks, for care-takers on large estates, for garage purposes, etc. The wood should be of a quality capable of taking a finish. Polished hardwood door frames, window frames and framework for the entire structure give a building of this nature an attractive appearance, when built up in unison with the cement wall and fillings.

False Bottoms for Roof Gutters

All gutters must, obviously, have a pitch or fall toward the outlet, and in the hanging type, such as the eave



False Bottom in the Gutters

trough, this fall is perceptible from the ground. Often if the fall is pronounced, it destroys the symmetry of the house. To overcome this, the molded face styles are made throughout and a false bottom which has the necessary fall to the outlet, soldered in, says the Metal Worker. Considerable trouble is experienced with these bottoms, owing to their breaking from the sides of the gutter, despite rivets and soaking in solder.

Inasmuch as these gutters are intended to be ornamental, the sketch shows how this ornamentation can be enhanced by extending a few of the stretcher courses of the brick work, and by alternating the bricks of the header course one in and one out, an appearance of dentil blocks is obtained.

The gutter proper can have the required pitch in the vertical members A, B and CD, and the facia piece E made separate and with a drip as shown. This facia piece is soldered to the gutter and, as gutters are usually made of heavy material, can be one or two gauge lighter.

At the lowest point or outlet, the bottom of the gutter will be down to the horizontal line of the facia piece, which rests on the brick work. The outlet tube is put in and soldered in the customary manner and would either connect with a leader on the outside or the inside of the wall.

The braces F are of galvanized or tinned band iron, ⅛ by 1-in. stock, bolted to the front part of the gutter and riveted to the roof flange of the gutter as shown. These rivets are soldered watertight on the under side.

If, instead, it is specified that these braces be attached after the setting of the gutter and nails driven through to the roof sheathing, then the entire brace must be soldered to the roof flange of the gutter to prevent leaks through the nail holes. The braces are made all alike and spaced 2 ft. apart.

The gutters are made in a length on the crown line from the outer edges of the fire or battlement walls G. At the inner lines of the walls, the roof flange of the gutter is cut and flattened out and forms a flashing which goes up and under the cap flashing that was built in with the wall. The wall flashing connects with this flashing of the gutter as shown in the illustration. Should the wall flashing be very high at the outer edges of the walls, use some roofers' paint skin and secure it to the wall with hooks to keep rain from blowing in behind the flashing at G. A much better method would be to step the flashing into the brick work.

Improved Sleeve Ironing-Board

A practical sleeve ironing-board, having both top and bottom boards shaped for such use, is shown in Fig. 1. When the board is placed on the table, one can iron without bending over it. The small board is for ironing sleeves of shirtwaists and dresses, the other for waists, shirts, children's clothes and small pieces. This board will also fit the shoulders and fronts of waists.

The board is made of pine or basswood; the spool for the upright can be obtained from a tailor. After the boards are cut as shown by the dimensions and rounded at both ends, they are fastened to the spool with long brads. Bore holes through the boards matching the holes in the spool, fill them with hot glue and drive dowels of hard wood through both boards and spool.

Half a yard of white felt will be sufficient to cover both boards and extend over the sides, so that it can be fastened with tacks. One yard of unbleached muslin will make four covers for the outside. Two spools of narrow tape are used to run through the casings of the slips and the tape tied underneath

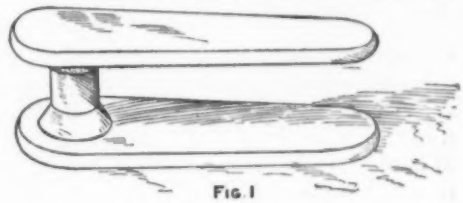


FIG. 1

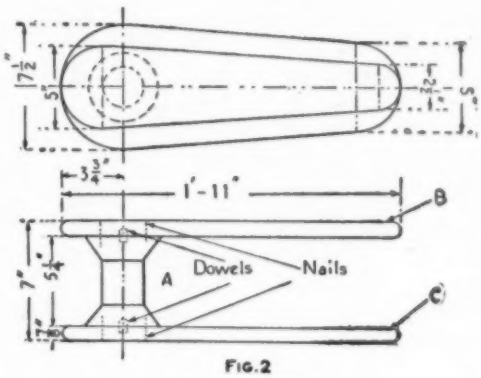


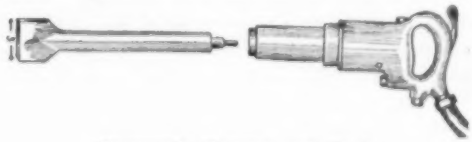
FIG. 2

Ironing-Board Details

the boards. Thus the slips can be easily removed and laundered. The upright, being made from a large spool, prevents the articles that are to be ironed from being caught underneath, and also gives depth enough between the boards to keep the waists and children's dresses in shape.—Contributed by Katharine D. Morse, Syracuse, N. Y.

Removing Old Paint with a Pneumatic Tool

Old paint on engine tanks can be quickly and effectually removed by using a boilermaker's 2½-in. stroke air-gun or pneumatic hammer, with a rip-

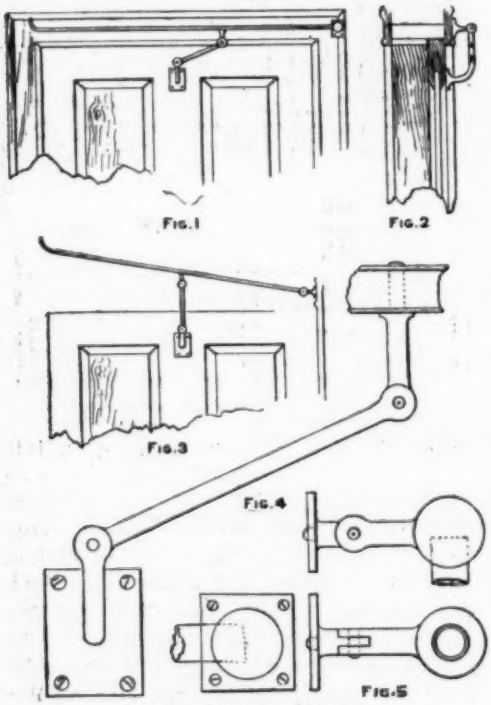


Pneumatic Hammer and Tool

per tool. Hold the ripper at an angle so as to clip off the paint and not cut into the metal.—Contributed by Harry F. Leonhardt, Minneapolis, Minn.

Automatic Lifting Curtain Rod

The accompanying sketch shows a curtain rod suitable for holding curtains in front of sitting room doors.



Details of the Curtain Rod

The rod is suspended in such a way that the opening of the door gradually lifts the curtain clear of the floor at the bottom edge. This is a decided advantage, as it allows the door to travel freely without the lower edge of the curtain dragging beneath the door.

In Fig. 1 is shown the rod in position when the door is closed and in Fig. 2 the side view. The rod should be made of ¾-in. brass tubing with one end inserted in a hinged joint, as shown in Fig. 5. The opposite end of the rod should be bent up to keep the curtain in place. If a bend in the rod cannot be made, a solid piece can be put in and soldered.

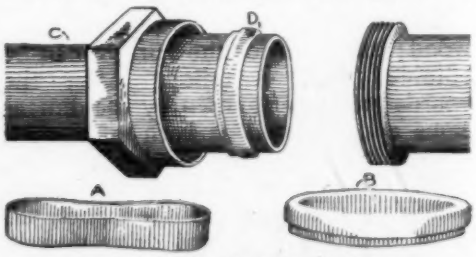
The hinge joint, Fig. 5, is to allow the rod to swing around with the door and at the same time turn slightly for the rod to rise. In Fig. 4 is shown the device for lifting the rod and Fig. 3 the position of the rod when the door is open.—Contributed by John T. Dunlop, Shettleston, Scotland.

Measuring Elevation by Water Pressure

To get the approximate difference in elevation of different parts of a city is a very easy matter where there is a waterworks system. This is done by attaching common steam gauges to the plumbing systems at each place and observing the readings. From the difference in pressure at the gauges, the difference in elevation in feet can be found. For every foot in height, the pressure will be .433 lb. per square inch. By multiplying the difference in pressure at the gauges for different elevations, by .433, we get the difference in elevation in feet. Suppose the gauge read 6½ lb. at the top of an elevation and 30½ lb. at the bottom. The difference is 24 lb. and this multiplied by .433 gives the approximate difference in height to be 10.392 ft.—Contributed by J. C. Murry, Lincoln, Nebraska.

Rubber Bands Used for Gaskets

The leaking of a rubber gasket on a piece of 2-in. nickel-plated pipe caused me to try an ordinary rubber band, A, in its place. In fact I used two rubbers, one over the other and each doubled as shown in B. When placed in position,



Rubber Band Used for Gasket

D, and the union parts screwed up, it made a tight joint. The rubber being elastic makes it adjustable, which is not the case with the ordinary gasket.—Contributed by J. M. Kane, Doylestown, Pa.

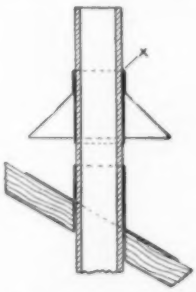
Pasting Labels on Tin

The curling of labels on tin, especially when the cans were first labeled and then filled with hot liquids, gave us much trouble in our factory until we started experimenting with the paste. We label our cans empty and then fill them with hot syrup, conditions which call for a very tenacious, tacky paste.

We use a fairly thin glue, made by soaking sheet glue in warm water until dissolved and then adding about one-fourth as much glucose (by volume) as we have glue. This paste applied either hot or cold with a brush will stick tight, will not affect the inks on the labels, as glycerine is apt to do, and will never curl, no matter how hot the contents of the can; neither will ordinary dampness loosen it. We have labeled more than a million and a quarter cans with this paste and have yet to see the first label so much as loosen at the corners.—Contributed by C. A. Munsterman, Peoria, Ill.

Attaching Pipe Flashings

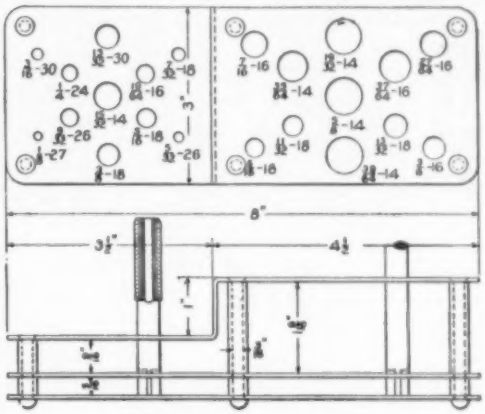
A novel method of attaching pipe flashings to exhaust, vent or vapor pipes that are subject to expansion and contraction, so that the rain will not follow down the pipe is shown in the accompanying sketch. Simply cut a groove, X, about ⅛ in. deep, about the pipe at the proper height, with a pipe cutter, then when the flashing is in place, bend the top edge into this groove. This will form a tight joint and prevent the rain from following down the pipe through the roof.—Contributed by S. S. Erickson, Seattle, Washington.



¶Do not lubricate magneto bearings too freely.

Steel Tap Rack

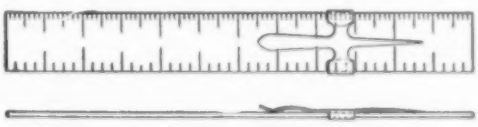
A simple and compact tap rack, which can be made in a couple of hours, is shown in the accompanying sketch. It will prove to be a time as well as a trouble saver, and being made of steel, it is well able to stand the rough usage to which all shop tools are subjected, and consequently very durable. Each hole in the top plate should be marked with the number of threads and the size of the tap it is intended to hold. The holder can be made larger or smaller than the one shown, but this size will be found about correct for the ordinary shop.—Contributed by C. A. Allen, Linwood, Mass.



Details of Tap Rack

Combination Scale and Scriber

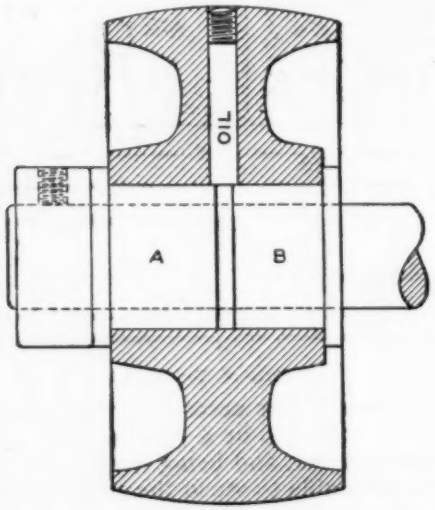
The accompanying sketch shows a 6-in. scale to which is attached a scriber made of tool steel. This scriber also acts as a pocket clip; in fact, that is the purpose for which it was originally designed, says a correspondent of Machinery. As a scriber is mostly used with the scale, the upper part of the clip was extended to form a scriber point, thus combining two tools in one.



Scriber on Rule

Bushing Loose Pulleys

One of the jobs that frequently fall to the lot of the repair man is that of renewing the bushings in loose pulleys,



Details of Bushing

says a correspondent of the American Machinist. Being regarded as a job not requiring a high order of skill, they are generally given to the poorest lathe hand, or to the boys. As a result, a simple job is the cause of considerable loss and inconvenience.

It is the usual practice to make these bushings of brass and to make tight fit in the pulley. Times without number, I have seen pulley hubs cracked through the desire to make the bush tight enough, and the bushing hole reduced in size, making necessary another operation in reaming or scraping the hole to fit the shaft. The brass usually found around the shop is not of the right character for the use to which it is put, and the slightest neglect in oiling starts it on its noisy way back.

The accompanying sketch illustrates a method we have employed for some years and for simplicity and economy in construction and efficiency in operation it is far ahead of the tight bushing. It has given complete satisfaction whenever used.

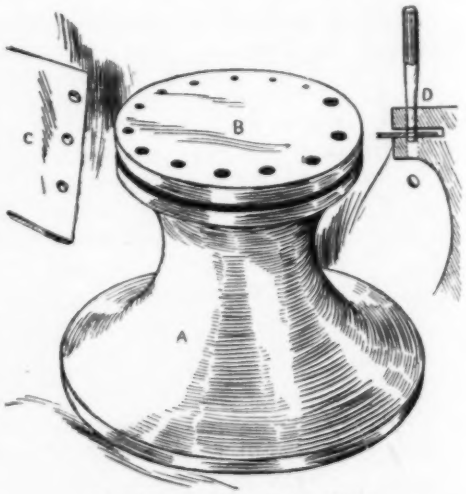
It consists of two flange bushings, A and B, of cast iron, bored and turned a running fit on the shaft, and in the pulley, with oil grooves inside and out, and an oil space in the center. Space for the flanges is obtained by facing the pulley hubs where necessary.

This style of bushing is easier to make, therefore cheaper, and will stand more abuse and neglect than the tight brass bushing, and if once used you will not revert to the old method.

Punch Block for Small Holes

Sheet metal workers will find the punch block, shown in the accompanying sketch, very handy for punching small holes in sheet metal. Its small size permits of it being carried about from place to place.

Turn up a block of steel, A, in the lathe to the desired size. Cut a groove about $\frac{1}{8}$ in. wide in the edge of the top flange. Around the top edge drill holes ranging in size from $\frac{1}{16}$ in. to



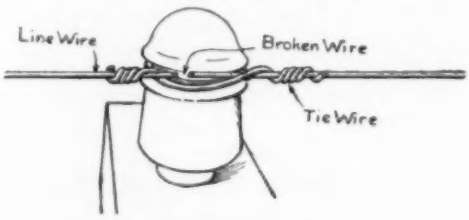
Punching Holes in Sheet Metal

$\frac{1}{4}$ in. and have a set of punches made to fit them. In punching a hole, slip the sheet C in the groove under the proper hole and set the punch on it. A sharp blow with a hammer will force the punch through, cutting a

smooth, clean hole. Better results will be obtained if the top flange is hardened after it is finished. The work done with this punch is fully as good as that done with a more expensive punch press.—Contributed by C. Purdy, Ghent, O.

Noisy Line Caused by a Tie-Wire Break

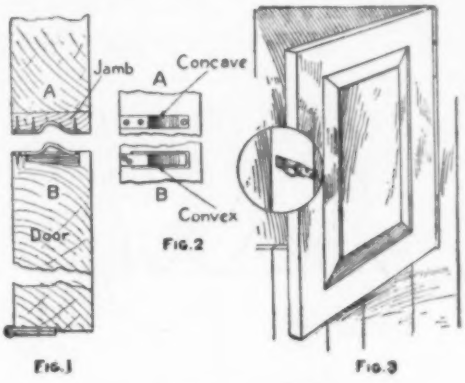
Having gone over a line that was reported noisy, and satisfied myself that the trouble was not in the instrument or fuses, I concluded that it was in the aerial, of which there were eight spans between the cable box and the instrument, says a correspondent of Telephony. On climbing a pole and examining the glass where the line was tied, I found the copper wire corroded and parted. It was held in place by the tie-wire, which was wrapped to hold the wires up, but would allow the ends to move just enough to cause the line to be noisy when a conversation was in progress. Splicing in a new wire cleared the trouble.



Showing Point of Break

Invisible Door Catch

A catch for small doors on cabinets, bookcases, etc., can be easily and quickly made of two pieces of spring brass about ¼ in. wide. These pieces are bent as shown in the sketch, one to form the concave, A, and the other to form the convex, B, part of the catch. The concave piece is fastened to the door jamb so that it will extend to the outer edge of the jamb as shown. The convex spring is then fastened to the door over a slot previously cut in and exactly opposite to the concave piece, so that they will fit together when the door is closed. The slot over



Invisible Door Catch

which the spring B is fastened should be cut deep enough to admit the end when it is pressed down flush with the edge of the door. This catch will hold the door securely, yet not so tightly that a slight pull will fail to open it.—Contributed by L. M. Eifel, Chicago, Ill.

Electrician's Tape Carrier

Secure an old key chain and put a wire through the end of it in place of the ring. Bend the wire around so it will not work loose from the chain. Slip the roll of tape on the chain as shown in the sketch. If allowed to hang outside of the garments, it will always be at hand when wanted, and save the electrician considerable time. —Contributed by W. T. Tarr, Joplin, Missouri.

¶Do not screw a spark plug in tight while the motor is hot. The result will be stripped threads when removing after the motor has cooled.

Calipering over Flanges

When it is necessary to gauge the thickness of a piece of work which lies behind a flange, the ordinary calipers

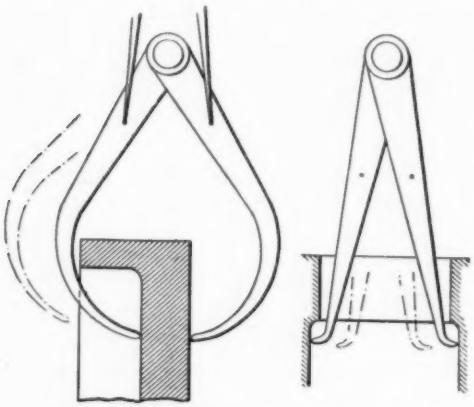


Fig. 1—Calipering with Prick-Punch Marks

are of no use, because the dimension is lost as soon as the calipers are opened for removal, says Machinery. The view to the left in Fig. 1 shows a neat method of repeating the setting. All that need be done is to make a fine prick-punch mark on the face of each leg, and carefully measure the distance between these marks with the points of a pair of dividers. After the calipers are removed they should be closed until the punch marks again coincide with the divider setting, when the dis-

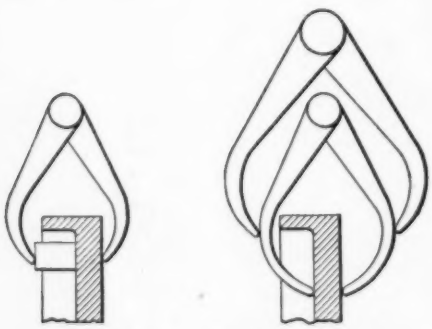


Fig. 2—Block or Two Pair of Calipers

tance between the caliper points will equal the thickness of the work. If this is done with care, very accurate results may be obtained. The same method is applicable to inside calipers when taking the size of chambered recesses, etc. The caliper setting is changed, as shown by the dotted lines, to get them out of the narrowed hole, and then they are again opened until the punch marks are the correct distance apart.

The methods shown in Fig. 2 are quicker and will permit measurements closer to the corner under the flange, To get the thickness of the flange, simply use a block as shown to the left in Fig. 2, then subtract the thickness of the block from the measurement obtained by the calipers. This method can also be used for measuring a chambered recess. If a block is not at hand, use a second pair of calipers as shown to the right in Fig. 2. After removing the first pair of calipers from the work, replace them to size by means of the second pair.

How to Repair a Cracked Water Jacket

Through neglect and carelessness many a gas engine water jacket is burst by being left with water in it on a very cold night. A crack of this sort gives a great deal of trouble and many times results in a loss of time in replacing with a new jacket or sending it to some factory to have it brazed.

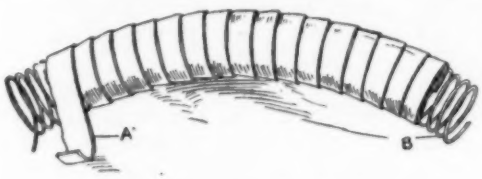
If the crack is in such a place that no strain comes on it except the water, it may be repaired in the following manner and will hold water as well as a new jacket would.

Mix litharge with glycerin to a stiff paste and force it into the crack with a putty knife or some similar instrument. After filling the crack, let it stand over night, if possible, and on starting in the morning run the engine until it gets well warmed up before turning the water into the jacket. If this mixture is properly applied, the job will be likely to last as long as the engine. One advantage it has over brazing is that it will give way again before breaking the cylinder, if the careless-

ness is repeated, and in this case, the mixture can be applied again in a short time and no serious delay will result. It is also valuable where the crankcase has been patched and leaks oil. This paste can be used in putting together the case in place of the regular packing. When the case is taken apart, the paste will cling to the metal and can be replaced as the regular packing.—Contributed by J. N. Bagley, Webber, Kansas.

An Emergency Hose

When in need of a short piece of hose for a siphon one day and having no ordinary hose at hand, I proceeded

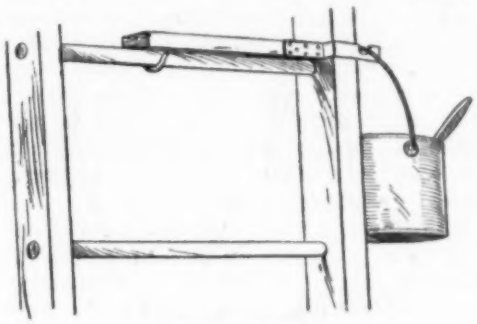


Oilcloth Wrapped around Spring

to make one from a blind roller spring and strips of oilcloth. The oilcloth was cut in strips 1 in. wide and then wrapped around the spring in a spiral, allowing each edge to overlap the other about ⅜ in. The oilcloth is shown at A and the spring at B in the sketch. Adhesive tape would be much better, but the oilcloth did good service.—Contributed by Wm. A. Robinson, Waynesboro, Pa.

Paint Pot Hanger Attachments for Ladders

The painter using a hook on the rung of a ladder for a pot hanger knows only too well how hard it is to dip the brush in the paint and draw it out without smearing the ladder or hands. The hanger illustrated herewith can be quickly adjusted to the ladder so the pot will hang n either side as desired. The pot is out of the way of the rungs and is free for dipping the brush in the paint. It consists of a strip of board about two-thirds as long as the rungs on the ladder, with two strips of iron fastened to one end and bent around the upright as shown. The irons are

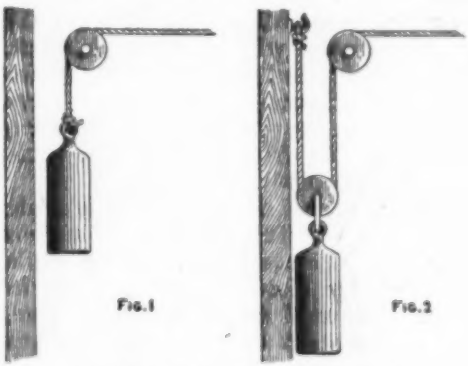


Pot on Hanger

notched on the ends to receive the bail of the pot. A small screw hook turned into the under side of the other end of the board holds the device in place on the rung desired.—Contributed by W. A. Jaquythe, Richmond, Cal.

Halving the Pull of a Weight

Sometimes the weight used to close a door or a gate is too heavy, and it is not convenient to secure a lighter one, says House and Garden. If you have a spare pulley that you can fasten to the top of the weight, you can reduce its pull one-half by lengthening the cord and carrying it through this pul-



The Weight Applied in Two Ways

ley, as shown in the illustration. The same weight is supposed to be used in both sketches, but arranged as in Fig. 2, it will pull only half as hard as in Fig. 1.

How to Make a Durable Heat-Black Finish on Brass, Bronze and Copper

The so-called "heat-black" finish on brass, copper or bronze, is one of the new methods of coloring metals that have recently appeared, and is one of the most durable. The color is an absolute dead black and is not difficult to apply to brass, bronze or copper, says the Brass World.

The article to be treated should be free from grease, although a slight tarnish does no harm. It is customary to sandblast the surface, although very good results may be produced without it. A sandblasted surface takes an excellent finish, but those who do not possess the necessary apparatus need not have any hesitation about using the finish.

Two stock solutions are first made up. One is a solution of nitrate of copper in water, and the other is a solution of nitrate of silver in water. The proportions need not be very exact, although it is preferable to keep them fairly close. The first is made up of 1 oz. of water, and 1 oz. of nitrate of copper. This gives a saturated solution of nitrate of copper in water and is used for a stock solution. If desired, the nitrate of copper may be easily made by taking 1 oz. of strong nitric acid and dissolving in it all the copper wire it will take up. A thick, blue solution is left, which is used for the stock solution. A few platers have nitrate of copper in stock, but if it cannot be readily obtained, it can be made up from copper wire.

The nitrate of silver solution is made up of 1 oz. of water and 1 oz. of nitrate of silver. This solution can be made up, also, by dissolving pure silver in nitric acid, until no more will dissolve, but dilute acid of equal proportions should be used, as silver does not dissolve readily in strong nitric acid. It is preferable, however, to purchase the nitrate of silver, as it is easily obtained. The nitrate of silver solution is practically a saturated solution and is used as a stock solution.

The mixed solution for applying to the metal is made as follows: water, 3 parts; nitrate of copper solution, 2 parts; nitrate of silver solution, 1 part. The solution is kept in a glass or stoneware vessel for use.

The brass, bronze or copper article to be treated is heated on a hot iron plate or in an oven to a temperature of about 250 deg. F. and the solution applied with a brush or cotton swab, so as to cover the surface uniformly. The brush should be a rather soft one so as to put on the coating in the best manner. The so-called rubber-bound brushes are the best for the purpose as there is no metal on them to be attacked by the solution.

One or two coatings of the solution on the surface of the article is usually enough, and it dries almost immediately, leaving a sort of green froth. The temperature is not sufficiently hot to draw the temper of hard brass, but it will usually melt soft solder.

When the entire surface has changed to a uniform black color, allow the article to cool and then brush off the fluffy material on the surface of the metal with a stiff bristle brush. The color will now change to a brownish-black that is quite pleasing for many purposes and which is very tenacious. When the fluffy material is completely brushed off, it is surprising how even and uniform the coating is and how well it adheres. If the brown black finish is desired, the surface may be now waxed or lacquered, but it is customary to give the article an additional treatment in a liver of sulphur solution, so as to change the brown-black coating to one that is absolutely dead black.

When the smut has been brushed off from the surface of the article, it is immersed in a cold liver of sulphur solution for five minutes. This solution is made by dissolving 2 oz. of liver of sulphur in 1 gal. of water. The article is immersed in it, allowed to re-

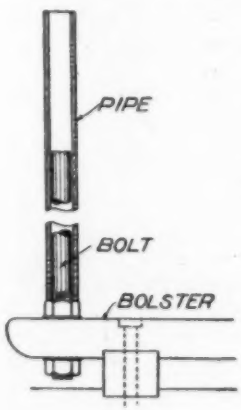
main about five minutes and then, without rinsing, is again heated until the surface is uniformly black.

The surface is again brushed with the bristle brush, when it will be found that the color is a dead black and quite uniform. It should be borne in mind that the article is not rinsed at all after it is removed from the liver of sulphur solution, but is simply drained off and then heated.

The article is now lacquered with a flat lacquer or waxed as may be desired. The final appearance of the surface will be found quite satisfactory and, contrary to what one would naturally expect, the coating of the solution that is first applied need not be very even, as long as a sufficient quantity is put on. If the surface is not satisfactory, or an old article is to be refinished, the wax or lacquer may be burned off and the process repeated.

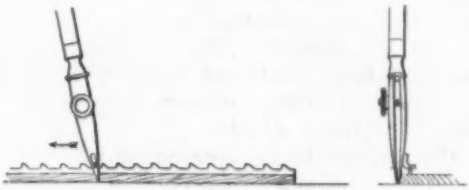
A Bolster Stake for Lumber Wagons

Some lumber companies equip their wagons with strong stud bolts, instead of the ordinary wooden bolster stakes. These bolts are much stronger than wooden stakes and hold the load much more securely. The bolt is about 18 in. long and is secured to the bolster with nuts on both sides, as shown in the accompanying illustration. This bolt is long enough for all ordinary loads, but when a higher load is hauled, pipes are slipped over the bolts as shown and the tops tied together with chains to keep them from spreading. These stakes are much handier to use than the wooden ones with the rings and pins.—Contributed by J. V. Romig, Allentown, Pa.



Dotting Attachment for Ruling Pens

The accompanying illustration shows a dotting device which a writer of Machinery uses in place of the expensive wheel or other dotting pens. The advantage of this is its cheapness, and the fact that either dotted or full lines may be drawn without any change whatever. A small rack with a series of rounded teeth is attached with cement or other adhesive to the face of the straight edge or T-square a little way back from the edge. On the back of the inner pen blade, a small piece of brass is soldered with a portion of the upper end turned out at right angles, so as to lie parallel with the face of the straight edge. This brass pin is set at such a height that when the pen is tilted over, about as illustrated, the pin just clears the bottom of the grooves in the rack, consequently permitting the pen to ink on the paper. In use, the pen is moved along, keeping it at the angle shown, and the teeth cause it to jump up and down, producing a series of dashes on the paper. A dotted line can be drawn in this way as far as a full one, and without any of the fatigue which is caused by dotting in the usual way. The pen should be held lightly, to let it rise and fall in an easy manner. By simply bringing the pen into a vertical position, the brass pin will clear the tops of the rack teeth, and a full line can then be drawn. The rack can be made from a piece of hacksaw blade, by reducing its width and filing out each alternate tooth and rounding off the remainder to suitable outlines.

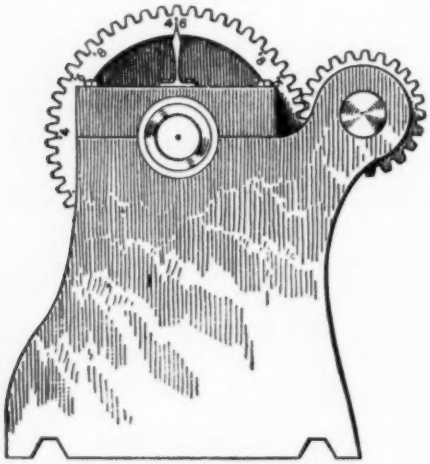


Dotting Attachment

¶Test a lathe for end shake from time to time.

Marking Turned Work in the Lathe

The lathe hand often has occasion to line off a turned piece of stock into a certain number of equal divisions, or



Gear Marked Off in Equal Divisions

parts, as in laying out bolt heads of triangular, square or hexagonal shape, in scribing a piece of stock for a key seat, or, in fact, in any case when equal spacing is required on a piece of turned stock. This is easily done, if the face of the large gear in the lathe head stock is marked off into equal divisions, and a stationary pointer supplied as shown in the accompanying sketch. Turn the gear until the hand points to the proper number, then scribe the work with a tool held in the toolpost. This puts the mark in the proper place. By putting in the back gears, the indications can be brought up very nicely. This idea can be applied to a great many other purposes.—Contributed by A. G. Smith, New York.

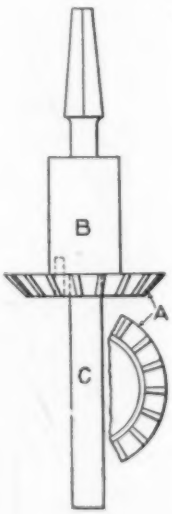
How to Cover a Pulley

It is an easy matter to cover a pulley, if the covering is prepared in the proper manner. The first thing to do is to remove all the old covering and pull out the nails and, if necessary, remove the wedges and replace them with new ones. The leather to be used for the covering should be wider than the pulley to be covered and about 3 or 4 in. longer than is necessary to reach around the pulley. Soak the leather in a pan of warm water for almost one hour. Square one end of the leather and nail it to the wedge, using nails that will just reach through and clinch on the side next to the pulley.

Stretch the leather as tight as possible and nail to the next wedge and continue until the last wedge is reached. Nail the leather to the last wedge before cutting it off. Trim the leather down to the rim of the pulley and the job is finished. Allow it to dry a short time, say 15 minutes, before putting it in service. If the leather is riveted to the pulley instead of being fast to the wedges, proceed in the same manner, punching the holes after the leather has been stretched.

Tool for Reseating Gas Engine Valves

Gas engine exhaust valves often become pitted from the action of the gases, and where the pits are not too deep, they can be ground out with emery very easily. If the valve has become warped from excessive heat, or the pits are too deep, it must be sent back to the makers to be reground and trued. The ordinary repairman can do the work just as well as it can be done at the factory and save much time, if he has a tool like the one shown in the accompanying sketch.

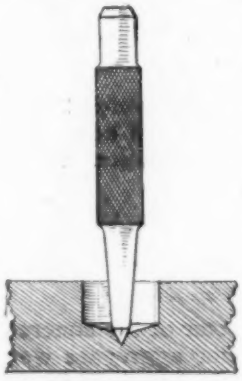


A cutting tool, A, is fitted on an arbor, B, and held in place by means of a pin. The arbor shank C should be of the same size as the valve stem, in order to hold the tool in line when in use. The arbor has a hole in the end to receive a common brace bit shank, so that it can

be turned. The cutting tool is made the exact size of the valve seat and has a pitch of 45 deg. After the tool has been shaped, cut small teeth around it as shown, being careful that all the cutting edges are of the same height and have the same pitch. The hole through the tool must be made to fit the arbor securely, but not so tight that it can not be removed for grinding. To temper the tool after it is finished, heat it to a cherry red, then plunge it into water or oil. Heat a block of iron and lay the tool on it, large side up, and draw to a deep straw color and cool. This tool will be valuable to the repairman who has much work of this kind to do on automobiles.—Contributed by J. N. Bagley, Webber, Kans.

Drilling Holes in Metal by Hand

Drilling a deep hole in metal with a brace-drill is a very hard job, as it takes quite a pressure to make a drill point take hold. In order to relieve the point, mark the work with a center punch which is well pointed. Drill until the punch mark is out, then make a new mark, say ⅛ in. deep, and drill again. Continue by marking and drilling and you will be surprised how quickly and easily a hole can be drilled.—Contributed by Ernest A. Nielsen, Boston, Mass.



Wrench for Turning Nickeled Fittings

I had occasion to move a bathtub and did not want to mar the coupling to the floor connection. I took two pieces of hard pine and cut the ends as shown in the sketch, mortising them as shown at A, so they could be tied together with a short piece of wire. The pieces should be at least 1½ by ⅞ in. and of a convenient length. They

The Wood Cannot Mar the Nickel

can be cut out quickly with a pocket knife.—Contributed by Orris A. Cummings, Palmyra, Ill.

Making Flexible Hose Connections on Auto Engines

When a clip is too large to tighten up properly on rubber water connections, wrapping a few turns of insulating tape

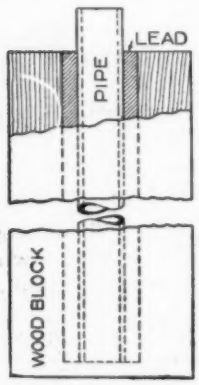
Enlarging Hose for Clips

round the tube to enlarge it, is a ready way of making the clip hold. A good substitute for a clip, and one that makes a good job, is to bind the tube with heavy twine, says the Automobile Dealer and Repairer. It is better than wire, and when wound on neatly and secured without a knot by underlaying the end, it looks well. To place it on, take about 5 ft., double it like a hairpin about 6 in. from one end, and lay it on the tube. Take the first round turn over all about 2 in. from the bend and draw taut, following with as many more turns as may be required. Work toward the loop, as shown in the sketch, but keep the turns close together. Pass the long end through the bend or loop, pull the short end, drawing the bight well under the turns, and then cut off the ends close.

¶Safety razor blades can be sharpened by immersing them in a solution of 1 part, by weight, of muriatic acid and 20 parts water for 30 minutes, then removing them and honing each one to a polish.

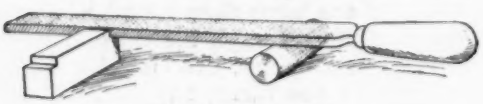
Casting a Short Lead Pipe

A plumber, who was finishing a job in the country, found himself short of about 1 ft. of lead pipe. As he was some distance from the supply shop, he devised the scheme shown in the accompanying cut for making the extra length of pipe from scrap lead. Securing a dry wood block of the proper length, he bored a 1¼-in. hole into it, lengthwise, with an ordinary wood auger. He set a ½-in. pipe, to serve as a core, in the center of the hole. He then melted his lead and poured it about the pipe, first greasing the wood and core to keep the lead from splattering. When the lead had cooled he split the block, removed the ½-in. pipe and found his cast pipe to be just what he needed.—Contributed by James E. Noble, Toronto, Canada.



Filing the Edges of Short Surfaces Level

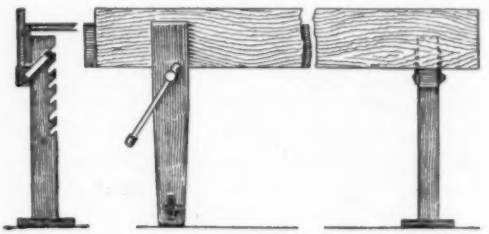
We had a few thousand small steel pieces ¼ in. wide with a little corner cut out, to be filed as shown in the sketch. It was difficult to file these and get them straight without sloping over on the outside edge, or filing more in front than on the back or vice versa. The method we finally adopted was rather novel. The pieces were placed on a flat metal plate with a steel roller of the same diameter as the height of the surface to be filed and in the positions shown in the sketch. The roller prevented the file from rounding the edge and also kept it from curving the shoulder in the other direction.—Contributed by Donald A. Hampson, Middletown, N. Y.



Filing Surfaces Flat

Holding End of a Long Board on a Bench

The ordinary carpenter's bench has an apron in which holes are bored for pins to hold the end of long boards. A device that is a good substitute for the pins and one that can be set at any point along the side of the bench, is shown in the sketch herewith. The main upright is a 2 by 3-in. timber, set on a square block. The top part of the upright along the back side is notched to receive a bolt. A block is attached with side bars in such a way that it may be raised or lowered to suit the width of the long board being surfaced on its edge.—Contributed by W. C. Heidt, Chicago.



Bench Jack

Failure by Disintegration of Concrete Roofing Blocks

The porous character of the concrete and the use of cinder aggregate were apparently the cause of failure in the reinforced concrete slabs, used on the roof of the LaSalle station trainshed at Chicago. The slabs were made up of a gravel concrete exterior shell, ½ to ¾ in. thick; the interior portion was of cinder concrete, used to reduce the weight.

The disintegration was caused by gases and moisture penetrating from below the gravel concrete shell and entering the cinders. The steel was enlarged in sections or swelled by rust, causing it to crack off the cement. The

new slabs, used to take the place of the old, were made of stone concrete throughout and, when finished, were treated with a solution to close and seal all pores so that neither gas nor moisture can penetrate the facing of the concrete.

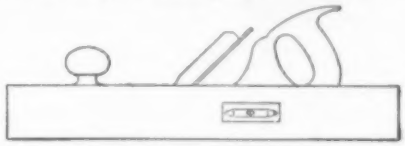
Tool for Inserting a Valve Stem

Often when inserting pump valves or other valves of a similar type, more or less trouble and inconvenience are experienced in getting the valve stem to catch the thread. This is on account of having to resist the pressure of the spring, while at the same time turning the stem, which, moreover, often has to be accomplished while reaching through a handhole. Therefore, if a number of valves are to be inserted, the work will be facilitated by temporarily compressing the springs to a uniform extent.

The accompanying sketch shows a very simple means of doing this. The flat piece of wrought iron A, about $\frac{1}{16}$ by ½ in. is bent into the form of a rectangle, leaving an opening on one side. The ends of this opening are caught under the spring, and the opposite side slipped over the head of the valve stem as shown. Thus the stem can be quickly and easily turned in, and the piece of wrought iron as easily slipped off.

A Level on a Plane

The carpenter who does many jobs outside the shop is always trying to economize as much as possible on the number of tools he must carry. Many carpenters will be able to make use of the idea shown in the accompanying sketch for combining a level with a jointer plane. It is made by letting into one side of the plane a small level, such as may be bought for a few cents,



Combined Plane and Level

sinking it far enough in to be out of danger of breakage.—Contributed by C. W. Nieman, New York, N. Y.

A Sawdust Filler

The following preparation will be found useful for filling unsightly cracks and holes in furniture and woodwork. Place a quantity of sawdust in an earthenware vessel and pour boiling water over it. Let it soak for about one week, stirring frequently, then place it over the fire and boil until it is of the consistency of thick paste. Pour it on a coarse cloth and squeeze out the excess moisture. When wanted for use, mix a little of it with a thin solution of glue water and fill the cracks or holes with it. When dry and painted over, it will have the appearance of ordinary wood. —Contributed by Andrew Soderlund, Jr., Newport, R. I.

A Window Stop

Bend a piece of rod at right angles and bore a hole in the bend. Fasten it to the window frame at the edge of the sash by turning a screw through the hole into the wood. When attached, it

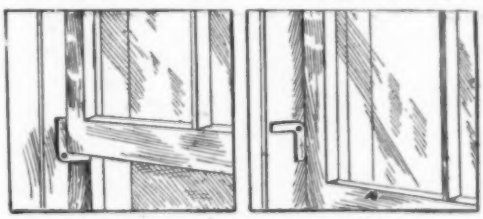


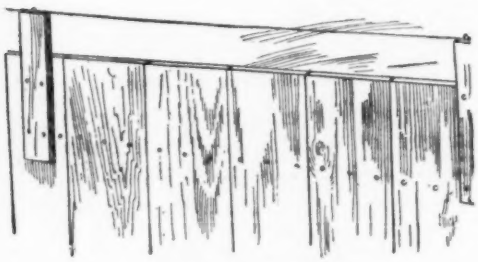
FIG. 1 FIG. 2

Catch in and out of Position

will support the sash as shown in Fig. 1. Figure 2 shows the sash released.—T. L. P.

Cat Guard for a Yard Fence

A simple way to prevent cats from using your back-yard fence for a concert stage is to place a wire 2 or 3 in.

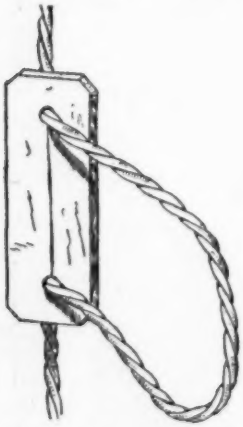


Wire on Fence

above and parallel with the top of the boards, and stretch it tightly. The wire makes it impossible for the feline to gain a foothold on the fence. The same method can be used to keep fowls from roosting on places where they are not wanted.—Contributed by Thomas L. Parker, Olaf, Iowa.

Flexible Lamp Cord Adjuster

While going through a local factory, I saw a device for holding an electric light and thought I might help others by passing the idea along. The device consisted of a piece of leather belt about 1 in. wide and 1½ in. long with a ⅜-in. hole punched in each end and the holes connected by a slit cut between them. The flexible cord is easily pushed through the slit, thus placing it in position without disconnecting the lamp socket. The cord can be pulled out in a loop so as to raise the light to any desired height. —Contributed by E. A. Gardner, Rochester, N. Y.



To Renew the Old Paint on a Buggy

The paint on a buggy soon loses its luster after it has been washed a few times. It may be brightened up, however, by the following method: Wash the buggy perfectly clean; then go over it with a rag moistened with linseed oil. Allow this to dry, then rub it with a soft rag.

Secure a pint of the best carriage varnish and a small can of paint of the same color as the original job. Add enough paint to the varnish to give it color, but not enough to cover up the stripes on the buggy when it is applied. Apply the same as varnish and allow plenty of time for it to dry. This adds much to the appearance of a buggy and protects the old paint.—Contributed by S. M. Hadley, Danville, Ind.

Tool for Cutting Boiler Plates

In the small machine shops where there is not a great variety of machines,

Fig. 1 Fig. 2

Roller Cutter

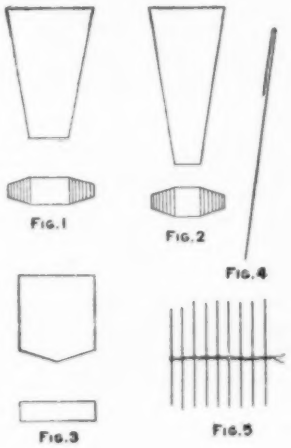
much scheming must be done sometimes in order to handle all kinds of work. In one shop of this kind it was necessary to split some sheets of $\frac{3}{16}$ and ¼-in. boiler plates. As there were no shears, the tool shown in the accompanying sketch was rigged up and used in the planer. A pipe cutter was fastened in a handle with a hardened steel pin as shown. By running this tool down the plate a few times, they broke quite easily.—Contributed by W. Clark, Cranbrook, B. C.

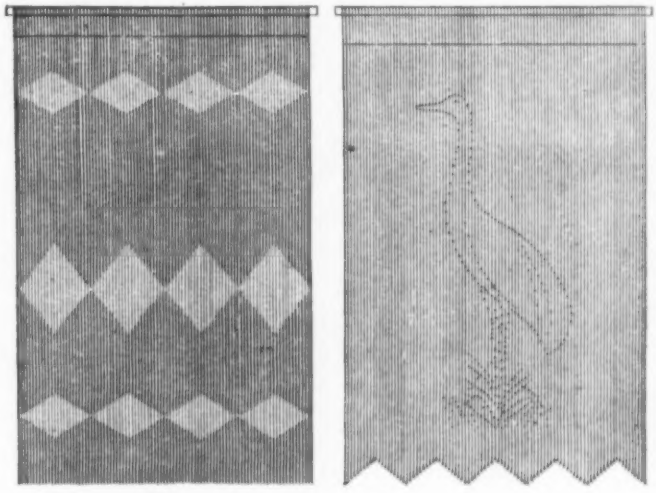
¶Storage batteries should fit or be held tightly in their box and all connections made secure. Sheet rubber is a good material for packing batteries. It deadens the vibrations and is a non-conductor of electrical currents.

AMATEUR MECHANICS

How to Make Japanese Portieres

These very useful and ornamental draperies can be easily made at home by anyone possessing a little ingenuity. They can be made of various materials, the most durable being bamboo, although beads of glass or rolled paper will produce good results. Substances such as straw, while readily adaptable and having a neat appearance, are less durable and will quickly show wear. The paper beads are easily made, as shown in Figs. 1, 2 and 3. In Figs. 1 and 2 are shown how the paper is cut tapering and as it appears after rolling and gluing down the ends. A straight paper bead is shown in Fig. 3.





Bamboo and Straw Portieres

The first step is to select the kind of beads desired for stringing and then procure the hanging cord. Be sure to get a cord having a size that will allow the beads to slip on readily and yet have the least possible lateral movement. This is important to secure neatness. One end of each cord is tied to a round piece of wood, or in holes punched into a leather strap. Iron or brass rings can be used if desired.

Cut all the cords the same length, making allowance for the number of knots necessary to produce the design selected. Some designs require only one knot at the bottom. It is best to make a rough sketch of the design on paper. This will greatly aid the maker in carrying on the work.

When the main part of the screen is finished, the cross cords, used for spacing and binding the whole together, are put in place. This is done with a needle made from a piece of small wire as shown in Fig. 4. The cross cords are woven in as shown in Fig. 5. As many of these cross cords can be put in as desired, and if placed at from 6 to 12 in. apart, a solid screen will be made instead of a portiere. The twisted cross cords should be of such material, and put through in such manner that they will not be readily seen. If paper beads are used they can be colored to suit and hardened by varnishing.

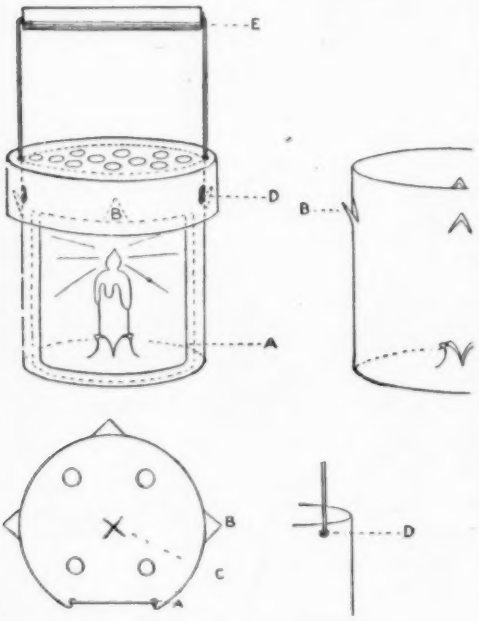
The first design shown is for using bamboo. The cords are knotted to hold the bamboo pieces in place. The fin-

ished portiere will resemble drawn work in cloth. Many beautiful hangings can be easily fashioned.

The second design is to be constructed with a plain ground of either straw, bamboo or rolled paper. The cords are hung upon a round stick with rings of metal to make the sliding easy. The design is made by stringing beads of colored glass at the right places between the lengths of ground material. One bead is placed at the extreme end of each cord. The rows of twisted cord placed at the top keep the strings properly spaced.—Contributed by Geo. M. Harrer, Lockport, N. Y.

Makeshift Camper's Lantern

While out camping, our only lantern was accidentally smashed beyond repair and it was necessary for us to devise something that would take its place. We took an empty tomato can and cut out the tin 3 in. wide for a length extending from a point 2 in. below the top and to within ¼ in. of the bottom. Each side of the cut-out A was bent inward in the shape of a letter S, in which was placed a piece of glass. Four V-shaped notches were cut as shown at B near the top of the can and their points turned outward. A slit was cut in the bottom, shaped as shown at C, and the pointed ends thus formed were turned up to make a place for holding the base of a candle. A larger can was secured and the bottom perforated. This was turned over the top of the other can. A heavy wire was run through the perforations and a short piece of broom handle used to make a bail.—Contributed by Maurice Baudier, New Orleans, La.



Lantern Made of Old Cans

New Tires for Carpet-Sweeper Wheels

The rubber tires on carpet-sweeper wheels often become so badly worn and stretched that they fail to grip the carpet firmly enough to run the sweeper. To remedy this, procure some rubber tape a little wider than the rims of the old wheels, remove the old rubber tires and wind the tape on the rims to the proper thickness. Trim the edges with a sharp knife and rub on some chalk or soapstone powder to prevent the tape from sticking to the carpet. A sweeper treated in this manner will work as well as a new one.—Contributed by W. H. Shay, Newburgh, N. Y.

How to Make an Ornamental Brass Flag

The outlines of the flag—which may be of any size to suit the metal at hand—and the name, are first drawn on a sheet of thin paper and then transferred to the brass by tracing through a sheet of carbon paper. The brass should be somewhat larger than the design.

The brass is fastened to a block of soft wood with small nails driven

through the edges. Indent the name and outline of the flag with a small chisel with the face ground flat, about $\frac{1}{16}$ in. wide. This should be done gradually, sinking the lines deeper and deeper by going over them a number of times. After this is finished, the brass is loosened from the block, turned over but not fastened, and the whole outside of and between the letters is indented with the rounded end of a nail, giving the appearance of hammered brass.

The edges are now cut off and four holes drilled, two for the chain by which to hang the flag to the wall, and two along the side for attaching the staff. The staff is a small brass rod with a knob attached to the top end.

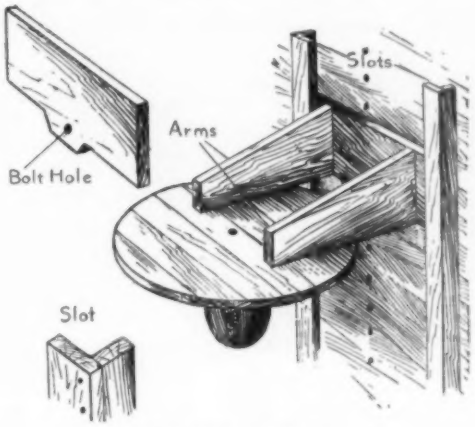
It would be well to polish the brass at first, if the finished work is to be

The Finished Flag

bright, as it cannot be done after the flag is completed. A coat of lacquer is applied to keep it from tarnishing. This is done by heating the brass and quickly applying a coat of shellac.—Contributed by Chas. Schaffner, Maywood, Ill.

An Adjustable Punching-Bag Platform

A punching-bag platform, suitable for the tall athlete as well as the small boy, is shown in the accompanying sketch. The platform is securely fastened to two strong wooden arms or braces, which in turn are nailed to a 2 by 12-in. plank as long as the diameter of the platform. This plank, as shown in the small drawing at the

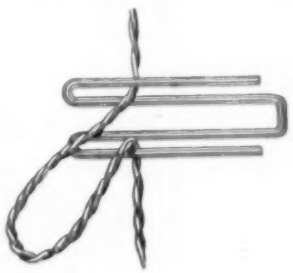


Adjustable Platform

upper left-hand corner of the sketch, is placed in grooves or slots fastened against the side of a wall. The plank with the platform attached may be raised or lowered to the desired height and held there by a pin or bolt put through the bolt-hole of the plank and into a hole in the wall.—Contributed by W. A. Jaquythe, Richmond, Cal.

Clasp for Holding Flexible Lamp Cords

A very easily made drop-light adjuster is shown in the illustration. It consists of a piece of copper wire $\frac{1}{8}$ in. in diameter, bent as shown. This clasp is capable of standing a strong pull and will hold the lamp and socket with a glass shade.—E. K. Marshall, Oak Park, Ill.



¶Camel hair brushes for painters' use should never be allowed to come in contact with water.

Frame for Displaying Both Sides of Coins

It is quite important for coin collectors to have some convenient way to

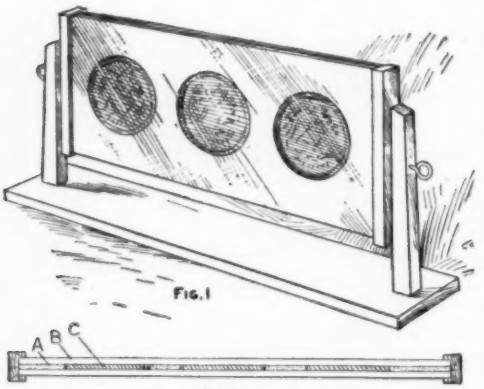


FIG. 2

Holding Coins between Glasses

show both sides of coins without touching or handling them. If the collection consists of only a few coins, they can be arranged in a frame as shown in Fig. 1. The frame is made of a heavy card, A, Fig. 2, the same thickness as the coins, and covered over on each side with a piece of glass, B. Holes are cut in the card to receive the coins C. The frame is placed on bearings so it may be turned over to examine both sides. If there is a large collection of coins, the frame can be made in the same manner and used as drawers in a cabinet. The drawers can be taken out and turned over.—Contributed by C. Purdy, Ghent, O.

How to Make Lantern Slides

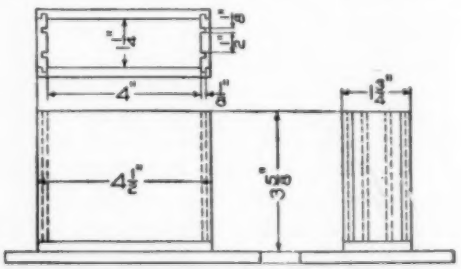
A great many persons who have magic lanterns do not use them very much, for after the slides have been shown a few times, they become uninteresting, and buying new ones or even making them from photographic negatives is expensive. But by the method described in the following paragraph any one can make new and interesting slides in a few minutes' time and at a very small cost.

Secure a number of glass plates of the size that will fit your lantern and clean them on both sides. Dissolve a piece of white rosin in a half-pint of gasoline and flow it over one side of the plates and allow to dry. Place the dried plate over a picture you wish to reproduce and draw the outline upon the thin film. A lead pencil, pen and ink or colored crayons can be used, as the rosin and gasoline give a surface that can be written upon as easily as upon paper. When the slide becomes uninteresting it can be cleaned with a little clear gasoline and used again to make another slide. A slide can be made in this way in five minutes and an interesting outline picture in even less time than that.

This solution also makes an ideal retouching varnish for negatives.—Contributed by J. E. Noble, Toronto, Canada.

How to Make a Developing Box

A box for developing 3¼ by 4¼-in. plates is shown in detail in the accompanying sketch. It is made of strips of wood ¼-in. thick, cut and grooved, and then glued together as indicated. If desired, a heavier piece can be placed on the bottom. Coat the inside of the box with paraffin or wax, melted and applied with a brush. Allow it to fill all crevices so that the developing box will be watertight. It will hold 4 oz. of developer. Boxes for larger plates



Details of the Developing Box

can be made in the same manner. Use a small wooden clip in taking the plates out of the box, being careful not to scratch the sensitive film.—Contributed by R. J. Smith, Milwaukee, Wis.

How to Make a Wireless Telegraph Set—Part V

By Arthur Moore

Construction of Telegraph Key and Aerial Wires

It is necessary that you have some means of making and breaking the primary circuit of your spark coil, so that there will be impulses sent out from the secondary winding corresponding to the intervals the primary circuit is closed. An ordinary telegraph key will serve the purpose very nicely when the primary current is not very large, and its mechanical operation will be the same as when it is being used on a telegraph line. The following simple construction may, however, be of interest to those who are constructing all of the various parts in preference to purchasing them, and want a key that will carry more current and have a larger and better contact than the ordinary telegraph key.

Cut from a piece of 1/8-in. sheet brass, a piece whose dimensions correspond to those given in Fig. 1. Cut a second piece, from some 1/8-in. stock, 5/8 in. wide and 7 in. long, and solder it to the first piece, as shown by the dotted lines D in Fig. 1. File off the edges and ends of this piece, after it is soldered in place, to conform to the outline of the main piece. Solder two other pieces, 1/2 in. wide and 3/4 in. long, to the first piece as shown by the dotted lines A and B, Fig. 1, and insert two pieces of 1/8-in. steel rod, of such a length that the ends project about 1/4 in. These projecting ends should be pointed, as shown in Fig. 2. Drill a 1/8-in. hole at F. The holes at H, G and I should be threaded for 3/16-in. screws. Cut another piece from some 1/8-in. sheet brass as shown in Fig. 3. The projecting arms P and P_1 should be bent up at right angles to the rest of the piece, at the points indicated by the dotted lines. Before bending these pieces, two holes should be drilled in them, as indicated in the figure, and threaded to take 3/16-in. screws. Place a 3/16-in. brass thumbscrew, with a lock nut on it, in the hole G, Fig. 1. The end of this screw should be turned down to 1/8 in. in diameter for a distance of 1/4 in. and a 3/8-in. washer of 1/16-in. brass made to slip on the end. Secure two 3/16-in. brass bolts, about 1 1/2 in. long, that are threaded their entire length and each having three or four washers and four nuts. Place one of these bolts through the hole H, Fig. 3, and fasten it in place with a nut on the under side. The other bolt should be fastened in the hole H_1, but insulated from the piece of brass. The hole H_1 should be drilled 5/16 in. in diameter and a small bushing with a 1/16-in. wall placed inside of it. The opening in the bushing should be 3/16 in. Place a metal washer on the bolt first, then an insulating washer and slip it through the hole and then place on a second insulating washer and metal washer and lastly the nut which will hold them all in place. This bolt should, however, have its head filed off flat and a small hole drilled in the center, into which a short piece of platinum wire is forced, and the projecting end hammered down, thus giving a platinum surface considerably larger than the area of the wire. Obtain two thumbscrews, about 1 in. long, that will fit the threaded holes in the arms P and P_1. Drill a 3/32-in. hole in the end of each of these screws and provide each with a small nut that will aid in holding them in place when their final adjustment has been made.

The piece shown in Fig. 3 can now be mounted on a wooden base. This base can be made from a piece of close-grained wood, about 1 in. thick, and its dimensions should correspond to those given in Fig. 4. The holes in this base should be countersunk on each side with a 5/8-in. bit to a depth of 1/4 in. so that the nuts on the screws used in mounting will be entirely below the surface. Mount two back-connected binding-posts in the corners of the base and connect them to the two screws with wires placed in grooves, cut in the under side of the base.

A small handle should now be turned

from a piece of hard rubber or very hard wood as shown in Fig. 5. This handle can be mounted on the piece shown in Fig. 1 with a 1/8-in. brass screw passed through the hole F from the under side. Obtain two thumbscrews about 1 in. in length that will fit the holes H and I, Fig. 1. Each of these screws should be provided with a lock nut. Drill a small hole in the end of the one you intend to put in the hole H and rivet a piece of platinum wire in place. A screw, S, should be provided on both the pieces shown in Figs. 1 and 3, to be used for electrical connections.

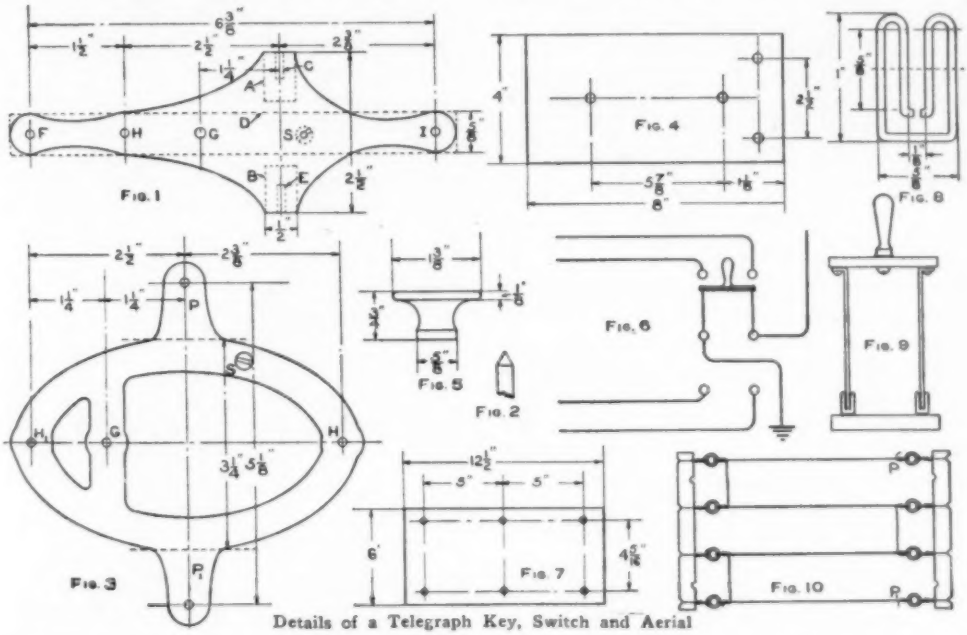
Make a small coil spring by winding a piece of No. 20 gauge steel wire around a 3/16-in. rod. The distance between turns should approximately equal the diameter of the wire, and the total length of the spring should be 5/8 in. Place the end of a piece of lamp cord about 4 in. long under the screw S, Fig. 1. Now mount the piece shown in Fig. 1 upon the piece shown in Fig. 3, making sure the coil spring is in place before the screws in the supports P and P_1 are given final adjustment. The other end of the piece of lamp cord can now be fastened under the screw S, Fig. 3. The screws in the holes H and I can now be adjusted, giving any desired movement of the handle before the contact is closed. The screw G can be adjusted to give any pressure of the spring desired.

It might be well at this point to give the construction of a special switch to be used in connecting the transmitting and receiving equipment to the aerial and ground. Figure 6 shows the scheme of connections, the switch being in the upper position when you are transmitting and in the lower position when you are receiving. The base of this switch should be made of slate or marble with its dimensions to correspond approximately to those given in Fig. 7. Cut from some 1/16-in. sheet brass, six pieces 5/8 in. wide and 4 1/4 in. long. Drill a 1/8-in. hole in the center of each of these pieces and bend them into the form shown in Fig. 8. Drill a 1/8-in. hole through two of these pieces after they are bent on the dotted line, shown in Fig. 8, as a center. Mount them all on the base with 1/8-in. brass bolts about 1 3/4 in. long. Each bolt should be provided with two additional washers and nuts to be used in making connections to the switch. Cut from some 1/8-in. sheet brass, two pieces 5/8 in. wide and 7 in. long. Drill a 1/8-in. hole in each end of these pieces, 5/16 in. from the end. Round off one end of each of the pieces to a 5/16-in. radius, with the hole as a center. Bend the other end over 5/8 in. from the end, forming a right angle. Cut from some hard rubber, a piece 6 in. long, 1 in. wide and 1/2 in. thick. Drill a 1/4-in. hole in the center of this piece and a 1/8-in. hole 1/2 in. from each end. These various parts can now be assembled as shown in Fig. 9. A small wooden handle can be attached to the rubber cross bar by means of a 1/4-in. screw, as shown in Fig. 9.

Your sending equipment is now complete, with the exception of the aerial. There are numerous forms of aerials and each is supposed to have certain advantages and disadvantages peculiar to itself. It is impossible to give the construction of all the different types, as it would lead to considerable confusion and you would be at a loss to know just which type to use. The type described below is known as the double ended "T" type and it is shown diagramatically in Fig. 10. First of all, you must select the location for your aerial, bearing in mind that it should be well up in the air and, if possible, not obstructed by adjoining buildings. You can no doubt place the aerial at the greatest height with the least trouble by supporting it on masts placed on the roof of the highest building near your station. The kind of mast to use will depend upon the requirements. In your case a 12 or 15-ft. mast will no doubt be ample, and a 2-in. iron pipe will do very nicely, as it can be easily handled. First obtain a good sized block of wood and cut it to conform to the shape of the roof. Then bore a hole in it that will take the pipe or wooden mast you are going to use and fasten it in place very securely.

Two or three guys should be attached to the upper end of the mast, before it is raised. They should be attached to the roof after the masts are raised in such a way that they will not interfere with the raising or lowering of the aerial wires. Place wooden pins in the upper ends of the pipes, and screw on them high tension insulators. Fasten a small pulley to these insulators with short pieces of seagrass line, and run sufficient ¼-in. bell cord through the knob should be tied in the center of a piece of seagrass rope about 4 ft. long, and the ends tied around the wooden stretchers where the remaining two notches are cut. One end of the ropes that pass through the pulleys on top of the poles should be tied to this porcelain knob.

Run some No. 14 gauge bare copper wire through the insulators fastened to the stringers, as shown in Fig. 10, and fasten the wire in place. Solder a piece



Details of a Telegraph Key, Switch and Aerial

pulleys to raise and lower the aerial wires. The distance between the masts will be governed by the size of roof, etc.; the greater this distance the better.

Cut from some well seasoned oak, two pieces 1¼ in. thick, 4 in. wide and 30 in. long and use them in suspending the aerial wires between the masts. Cut notches in these pieces as shown in Fig. 10, and tie four porcelain knobs to each of the pieces with seagrass rope. The knobs should have a play of at least 4 or 5 in. The four equally spaced notches should be used in preventing the ropes from slipping along the wooden pieces. A good size porcelain

of No. 14 gauge copper wire to the points P and P_1, Fig. 10. In the center of this piece, solder another piece that will lead into your instrument.

The lead-in wire should be made as clear as possible, and by that is meant to use just as few insulators as you can conveniently get along with, since each tends to dissipate a certain part of the high-tension current and thus greatly lowers the efficiency of your sending or receiving. The wire should be well taped and passed through a heavy porcelain tube where it goes through the wall, or a better way still would be to drill a hole in the window pane and pass the wire through it.

(To be continued.)

New Way to Remove a Bottle Stopper

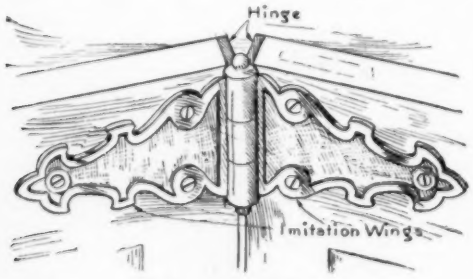
Take a bottle of liquid, something that is carbonated, and with the aid of a napkin form a pad which is applied

Removing the Stopper

to the lower end of the bottle. Strike hard with repeated blows against the solid surface of a wall, as shown in the sketch, and the cork will be driven out, sometimes with so much force that a part of the liquid comes with it and deluges the spectators, if desired by the operator.

Imitation Fancy Wings on Hinges

The accompanying sketch shows how I overcame the hardware troubles when I was not able to find ready-made hinges in antique design for a mission sideboard and buffet. This method allows a wide range of designs, which

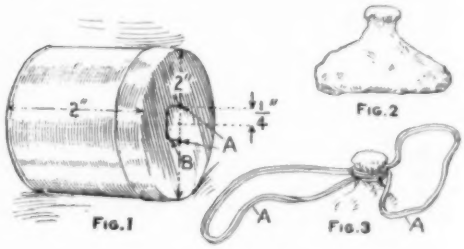


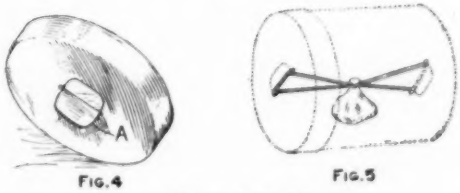
Fancy Hinge Wings

can be made at home with ordinary tools. The wings are made of copper or brass and finished in repoussé, or can be tarnished and the high places burnished with 000 sandpaper or steel wool, then lacquered with white shellac or banana bronzing liquid.—Contributed by John H. Schatz, Indianapolis, Ind.

How to Make a Child's Rolling Toy

Secure a tin can, or a pasteboard box, about 2 in. in diameter and 2 in. or more in height. Punch two holes A, Fig. 1, in the cover and the bottom, ¼ in. from the center and opposite each other. Then cut a curved line from one hole to the other, as shown at B. A piece of lead, which can be procured from a plumber, is cut in the shape shown in Fig. 2, the size being 1 by 1⅛ by 1¼ in. An ordinary rubber band is secured around the neck of the piece of





Rolling Can Toy

lead, as shown in Fig. 3, allowing the two ends to be free. The pieces of tin between the holes A, Fig. 1, on both top and bottom, are turned up as in Fig. 4, and the ends of the bands looped over them. The flaps are then turned down on the band and the can parts put together as in Fig. 5. The can may be decorated with brilliant colored stripes, made of paper strips pasted on the tin. When the can is rolled away from you, it winds up the rubber band, thus storing the propelling power which makes it return.—Contributed by Mack Wilson, Columbus, O.

Wood-Working for Beginners

By IRA S. GRIFFITH

Chapter VIII

Squaring Up Rough Stock

The process of squaring up rough stock—stock which has not passed through the mill planer—is not so very unlike that for squaring up mill-planed stock. The main differences, however, are very important.

Leveling or Truing the First Broad Surface

Level up one of the broad surfaces for a face side, taking off as few shavings as possible. A level surface is one of which all points lie in the same plane. To level a surface, therefore, means to plane off the high places. Figure 42 shows a surface "in wind" or not level or true, also, a true surface.

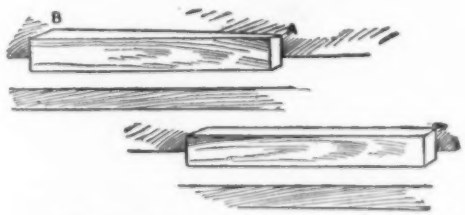


Fig. 42—Winding and a True Surface

There are several ways of testing a surface to find whether it is true or not. An experienced mechanic would probably find the eye sighting test sufficient. This consists in closing one eye and sighting with the other along the length of the piece for straightness, Fig. 43. Another test is to sight across the piece to see whether the front arris and back arris line up, i. e., whether they lie in the same plane, Fig. 44.

A beginner will find it advisable to use the following test in addition, until his eye has become trained in detecting inaccuracies. This test is used by mechanics when great accuracy is desired. It consists in testing for wind by means of winding sticks and in testing for straightness of length and width by

Fig. 43—Testing for Straightness

means of a straightedge. Testing for a wind, Fig. 45, is made by placing two straight sticks, having parallel edges, across the piece near the ends and sighting (with one eye) across their top arrises. If the surface is in wind, the arrises will appear as in A, Fig. 46. If not in wind, the arrises of the sticks will appear parallel as in B, Fig. 46. The straightedge test for length is similar to that for the edge, Fig. 33. In Fig. 47 is shown the straightedge test across the grain.

A substitute for the winding stick test, on pieces of some width—three or more inches—consists in placing the straightedge along the two diagonals.

Fig. 44—Testing for Twist

The straightedge test for length and width must be given as usual, in addition to the diagonal test. These tests

Fig. 45—Sighting for Winding of Surface

will show where and how much is to be planed and will need to be made frequently as the planing proceeds.

If the piece is in wind, two diagonally opposite corners will appear high. Plane diagonally across the piece until these corners are roughly leveled. It may be that the middle is on a level with these corners and the other two corners are low with reference to the center of the board. In this case, the diagonal planing will take the middle down as well as the two high corners.

Fig. 47—Testing Across the Grain

Finish by planing parallel to the grain, so as to leave a smooth surface. Put on the face mark.

Planing the First Edge

Straighten and square one of the edges for a face edge. This is done in the same way as for stock S-2-S, described in the preceding chapter.

The directions for gauging to width are the same as those given in a preceding chapter, also planing for the second edge.

Gauge to Thickness

Since rough stock is variable in thickness, it will be necessary to set the marking gauge to the thickness wanted and mark sharp lines, one each on the two edges. Keep the head of the gauge against the face side in so doing.

Planing and Testing Second Surface

Since the face side was leveled and the thickness gauged from this, the sec-

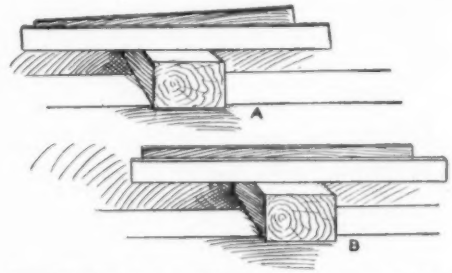


Fig. 46—Showing a Winding and a True Surface

ond surface ought to be level and true, if the planing is made to stop at the gauge lines on the two edges and if the middle of the board is neither high nor low with reference to these lines. To see whether the middle is high or low, place the straightedge across, as in Fig. 47, and test at a sufficient number of places to show the true condition. This test must be made frequently while approaching the lines, that the surface may be level when the lines are reached —at least not low in the middle, for there would be no remedy for that without decreasing the thickness below what is desired.

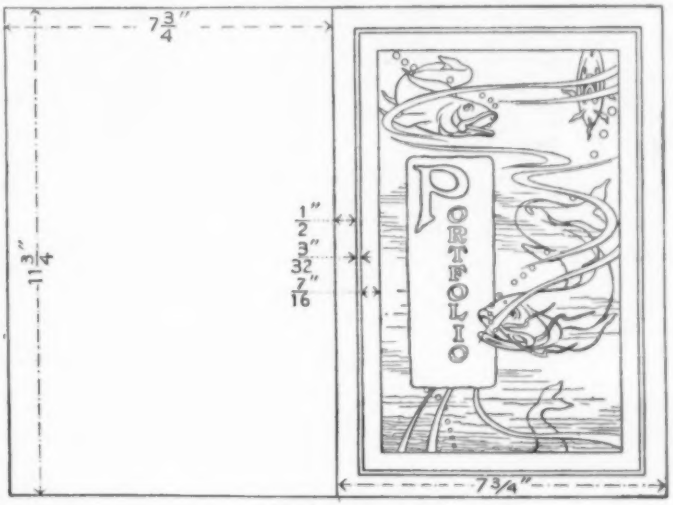
The directions for planing first end, measuring length and lining and planing second end will be found in preceding chapters under the same heads.

(To be continued.)

How to Make a Portfolio

Secure a piece of Russian modeling calf leather of a size equal to 12 by 16 in. Make a paper pattern of the size indicated in the accompanying drawing, putting in the design.

The necessary tools consist of a stick with a straight edge and a tool with an end shaped like that of a nutpick. A nutpick with a V-shaped point will do if the sharpness is smoothed off by means of a piece of emery paper, so that it will indent without cutting the leather. These tools can be bought for this special purpose, but are not essential for this piece if the nutpick is at hand. There will also be needed a level, non-absorbent surface upon which to lay the leather while working it. A piece of thick glass, metal, or marble will serve.



Portfolio Design

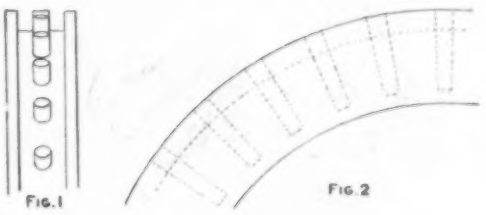
Begin work by moistening the leather on the back side with a sponge or cloth. Moisten as much as you dare and still not have the moisture show on the face side. Next place the leather on the glass, face up, and, holding the pattern firmly in place so that it will not slip—if possible get some one to hold the pattern for you—place the straight edge on the straight lines and mark out or indent. After this has been done, mark over the design. A pencil may be used the first time over.

The pattern is now to be removed and all the lines gone over with the tool to make them deep and uniform.

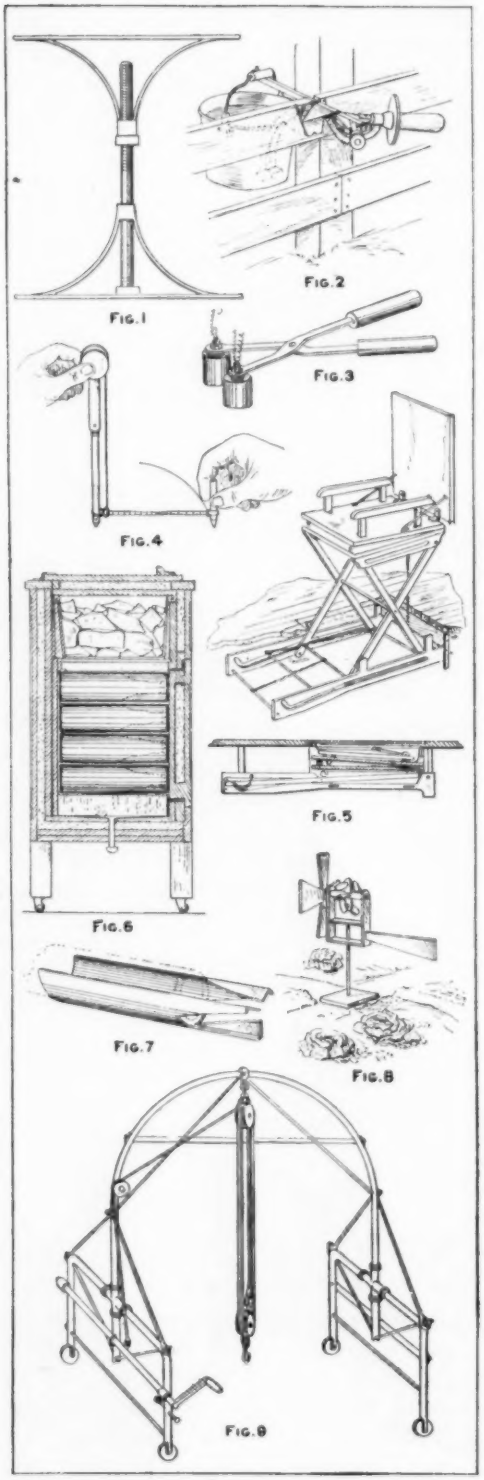
The surplus stock around the edges may not be cut off. A neat way to finish the edges is to punch a series of holes entirely around through which a thin leather thong may be laced. If it is desired to "line" the inside, this should be done before the holes are punched or the lacing done.

Gear for Model Work

When a gear is needed to drive a small pinion and there is none of the right size at hand, one can be made in the following manner: Turn up a wood disk to the proper diameter and 1/4 in. thicker than the pinion, and cut a flat bottom groove 3/16 in. deep in its face. The edges should be about 1/8 in. or more thick on each side. Measure the distance between centers of two adjacent teeth in the pinion and step this off around the periphery in the bottom of the groove. Drill holes into the wood on each point stepped off and insert steel pins made of wire, allowing the end of each to protrude just far enough to act as a tooth. In this way a good gear for light work can be quickly and cheaply constructed.—Contributed by Henry Schaefer, New York City.



Steel Pins in Wood



INTERESTING PATENTS,

ADJUSTABLE SHELF SUPPORT—An adjustable shelf support, of the order illustrated by Fig. 1, is often found very useful. By turning the nut, the upper bracket is raised or lowered to suit the requirements.

SIMPLE FEEDER FOR CALVES—Feed tubes, nipples, a metal support, and an ordinary pail, assembled as shown by Fig. 2, provide a simple portable feeder for calves. A notch is cut in one of the boards of the fence or other obstruction forming the enclosure in which the calves are kept, and the support is made fast over this notch. The feed tubes leading from the bottom of the milk pail to the nipples, pass through the notch, protected by the metal of the support.

ELECTRIC GARMENT CREASER—Figure 3 is an easily operated electric device for the creasing of trousers or other garments. The rollers at the ends of the pivoted arms are provided with electric resistance coils as a means of heating them. The coils can be connected with a flexible wire attachment to any ordinary electric light socket.

DEVICE FOR MEASURING AND DRAWING ARCS—A device designed for measuring and drawing arcs is illustrated in Fig. 4. It consists of a tape holder mounted at the top of a center tube. The tape passes from the holder down the outside of the tube to a ring guide near the base. The marker is attached to the end of the tape, which is pulled out the required distance to make the desired arc. A finger piece on the holder prevents the tape unwinding when pressure is exerted against it.

AUTOMATIC FOLDING CHAIR FOR THEATERS AND AUDITORIUMS—An automatic folding chair, which folds into the floor the moment the occupant arises from it, is illustrated in Fig. 5. When the chair folds down, its back fits into the opening in the floor, closing the opening in the manner of a trap door. The chair is designed for use in theaters, churches, convention halls, and like places where large numbers of people congregate. Its main object is to instantly clear away all obstructions to rapid exit in such emergencies as fire. The method of automatic operation is as follows: The folding side arms and back are secured to the seat by hinges provided with springs. The occupant of the chair pushes the back up, opens out the arms, and sits down, the pressure on the seat keeping the arms and back in place. When the pressure is removed from the seat, the springs are released and the arms fold down. This movement of the arms operates in turn on the braces holding the chair extended, and the whole sinks into the floor.

REFRIGERATOR FOR THE COOLING OF BOTTLED LIQUIDS—A small, compact refrigerator has been designed for cooling bottled liquids (Fig. 6). The ice receptacle is in the top, as in the majority of portable refrigerators, beneath which is a series of horizontally disposed holders for bottles. The water produced by the melting ice drips over the bottle holders, and finds an outlet at the bottom. If rapid cooling is required, the ice is broken into small pieces and salt is added.

SHOT SPREADER—A shotgun attachment designed to spread the shot is illustrated by Fig.7. It consists of a split member, formed to grip the muzzle end of the barrel, and provided with shot spreading vanes extending forward, the inner edges of which are flared downwardly toward the muzzle end of the gun.

A WINDMILL SCARECROW—A new form of scarecrow (Fig. 8) is built on the lines of the toy windmills. The whirling of the wind wheel operates clappers, which are expected to make a noise to scare away the birds. The greatest drawback to the idea seems to lie in the fact that it will not operate when there is no breeze.

PRACTICAL OR UNIQUE

A HOIST FOR FARM PURPOSES—A hoist designed for raising and moving heavy objects is shown in Fig. 9. It was especially designed as a farm hoist.

PORTABLE MUSHROOM GROWER—A portable mushroom grower, with irrigation attachment, is shown in Fig. 10. It consists of six tiers of troughs, each tier being provided with a perforated pipe for spraying.

SELF-CHALKING CHALKLINE—A chalkline that is re-chalked every time it is drawn out of its holder is illustrated by Fig. 11. The holder, which is nickel-plated, is 3 in. in diameter and 1 in. in thickness, so that it may be carried in the user's pocket. The reel within the holder contains 50 ft. or more of line. Between the reel and the casing powdered chalk is packed, which chalks the line.

WHIP-SOCKET LOCK—The drawings designated as Fig. 12 show a whip-socket provided with a readily operated mechanism whereby the whip may be locked within the socket. The first drawing shows the latch plate released and drawn out, while the second shows the whip in the socket, and the latch plate locked in place with a key.

A REVOLVING KITE—A kite that spins like a windmill as it flies is illustrated by Fig. 13. Triangular vanes are mounted on a circular frame, and the pressure of the wind against the vanes causes them, and the frame to which they are made fast, to revolve. Cords connect the circular frame with a pendulum-like piece of wood in which a bolt or rotable shaft is loosely mounted.

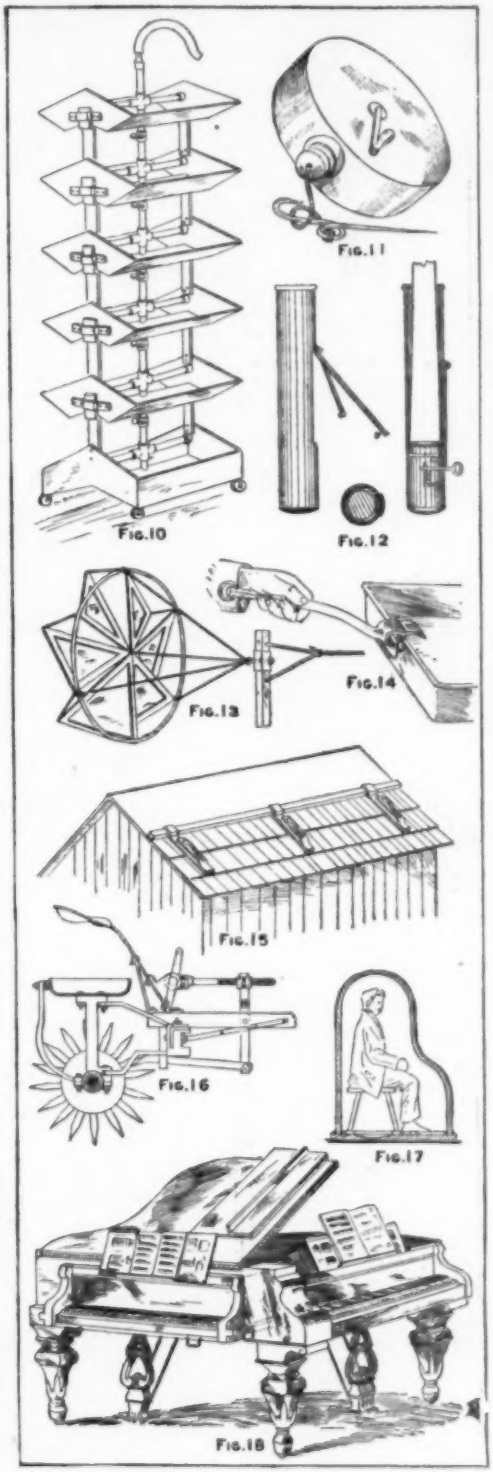
PAN-LIFTER—A detachable lifter for pans of the flat-sided type used for roasting meats and baking is illustrated in Fig. 14. The spaced jaws are adapted to engage with the rim of the pan and with the wire-loop handle with which such pans are usually provided.

SOMETHING NEW IN SHINGLING GAUGES—Figure 15 shows three shingling gauges of a new type set in position for operation. The gauge comprises a finger adapted to be slipped under a set shingle, a straightedge support provided with means to engage with a set shingle, a plate connected to the straightedge support and to the finger, and means of exerting pressure to make the straightedge support engage with the shingle. Preferably three of the gauges are used, attached as shown in the drawing to a straightedge support. The gauges are held in position by slipping the finger up under the course of shingles last laid and pressing down the cam levers until the claws engage with the shingles. The straightedge is adjusted according to the length of the shingles.

REVOLVING HARROW—A new revolving harrow (Fig. 16) has been added to the long list of agricultural implements. Instead of the knives being dragged through the soil, as with the ordinary harrow, they revolve like a wheel.

BURIAL CASKET IN WHICH THE CORPSE SITS—A very curious and extraordinary burial casket has just been patented by an Italian inventor living in Philadelphia. The specifications state that it consists of a base with a bell secured to it, said base being provided with means for securing in position within the bell a stool upon which a corpse may be seated. The stool is also provided with means for maintaining the corpse in an upright position.

TWO PIANOS WITHIN ONE CASING—An unusual piano arrangement is illustrated by Fig. 18. It consists of two complete instruments mounted within one casing, the two instruments being separated from each other by a partition, and each instrument having its separate keyboard. One of the instruments may be drawn out of the case a few feet when in use.



"SAY, do you need a boy?" queried the little fellow, as he stepped inside the door of the ice dealer's office.

"Ever been in the ice business?" queried the dealer.

"No, sir."

"Know anything about arithmetic?"

"Not much."

"What would 20 pounds of ice amount to at 2 cents a pound?"

"Eighty cents."

"Good boy! Come around in the morning and go to work."—Chicago News.

◆ ◆ ◆

A teacher was giving a "Lesson on the Cow." She was trying to impress on their young minds the various uses of milk. Butter, cheese, etc., had been disposed of, and she wanted some bright child to tell how the farmer gave the surplus milk to the pigs. Leading up to this, she asked the question:

"Now, children, after the farmer has made all the butter and cheese he needs and uses what milk he wants for his family, what does he do with the milk that remains?"

Dead silence followed for a moment, and then one little hand waved frantically.

The teacher smiled and said, "Well, Tommy?"

"He pours it back into the cow," piped Tommy.

◆ ◆ ◆

The ever-burning question, "What shall we do with our boys?" seems to be satisfactorily answered in the following advertisement, which appears in the window of a Farrington Road butcher's shop: "Wanted, a respectable boy for beef sausage."—London Tribune.

◆ ◆ ◆

A doctor related the following story: "I had a patient who was very ill and who ought to have gone to a warmer climate, but whose means were insufficient, so I resolved to try what hypnotism would do for him. I had a large sun painted on the ceiling of his room and by suggestion induced him to think it was the sun which would cure him. The ruse succeeded, and he was getting better rapidly when one day on my arrival I found he was dead."

"Did it fail, after all, then?" asked the doctor's hearers.

"No," replied the doctor; "he died of sunstroke."

◆ ◆ ◆

"Why do we send missionaries to the savages?" asked the man.

"To civilize them."

"What good does that do them?"

"It educates them out of habits of idleness."

"And what then?"

"They go to work."

"What do they work for?"

"To become prosperous and rich."

"What good does prosperity do them?"

"It procures them leisure and comfort."

"Which was what they had before you started stirring them up. What's the use?"—Cleveland Leader.

◆ ◆ ◆

"You know the poet says a man must be either the hammer or the anvil."

"Lots of fellows I know are more like the bellows."

"Were you ever arrested before?" asked the magistrate, whose principal business is imposing fines for speeding.

"What do you think I've been doing all of these years?" said the chauffeur, "pushing a wheelbarrow?"—Chicago Journal.

◆ ◆ ◆

"Willie," said the Sunday school teacher, "who slew the giant Goliath?"

"Why-er-lemme see," stammered Willie.

"Come, now, that's an easy question."

"Oh, it ain't the question that bothers me; it's the answer."—Philadelphia Press.

◆ ◆ ◆

When a merchant in the Hill district, who had been standing in front of his store, saw two young men stop, the other day, and begin looking over his wares, he naturally was pleased and gave them immediate attention, says the Pittsburg Times-Gazette.

"I want to know," began one of them, "if you have any clean shirts ready to wear."

"Certainly, certainly" was the quick response.

"Well, then, go in and put one of them on," was the reply of the smart young man as he and his companion continued on their journey.

Eye-witnesses say that the merchant didn't laugh.

◆ ◆ ◆

A traveling salesman stopping at a hotel in a country town on circus day refused to use the wet and soiled crash towel in the lobby.

In response to the drummer's protest the colored porter said, deprecatingly:

"Boss, seventy-five men has wiped dere han's on dat tow'l dis mornin,' an' you is de fust ter complain!"—Circle.

◆ ◆ ◆

A newly rich couple whose early education was trivial came from York state to visit the wonders of Chicago. They put up at Auditorium Annex. After supper Reuben left the apartments, telling his wife that he would return quickly. Hours passed and brought no husband. At last, near midnight, the wanderer came back. "Where have you been?" asked the worried woman. "Oh, nowheres. Just out in the cuspidor, walking pro and con."

◆ ◆ ◆

The young son had been naughty and had been sent to bed supperless.

Presently when the boy's mother wasn't looking, his father slipped upstairs and whispered through the door of the boy's room: "Son, could you eat some honey in the comb?"

"Dad," the boy said, "I could eat it in the brush."

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"He saved my life," declared the millionaire. "Hand me a fountain pen, somebody."

"Going to make out a check?"

"No; going to indorse him for a Carnegie medal."

◆ ◆ ◆

"And your husband is a yachtman?"

"Yes, and he has a nice boat of his own."

"Is it a centerboard boat?"

"N-no. From what I hear it is a sideboard boat."

NEW BOOKS

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